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A

SYSTEM OF GYNECOLOGY.

BY AMERICAN AUTHORS.

EDITED BY

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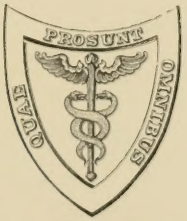
VOLUME II.

ILLUSTRATED WITH FOUR COLORED PLATES AND THREE HUNDRED AND SIXTY-ONE ENGRAVINGS ON WOOD.



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Printer, Philada.

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CONTENTS OF VOLUME II.

PAGE

THE DISEASES OF THE VAGINA. By Charles Carroll Lee, A. M., M. D. 17

THE HYSTERO-NEUROSES. By George J. Engelmann, M. D. 59

EXTRA-UTERINE GESTATION. By T. Gaillard Thomas, M. D. . . . 175

TUMORS OF THE BREAST. By Samuel W. Gross, M. D., LL.D. . . . 197

DISEASES OF THE BREAST OTHER THAN TUMORS. By Roswell Park, A. M., M. D. 335

FISTULÆ. By Edward W. Jenks, M. D., LL.D. 369

DISEASES OF THE BLADDER AND URETHRA. By William H. Baker, M. D. 447

NON-MALIGNANT TUMORS OF THE UTERUS. By R. Stansbury Sutton, A. M., M. D., LL.D. 549

THE MALIGNANT DISEASES OF THE UTERUS. By W. T. Lusk, M. D. 601

LACERATIONS OF THE CERVIX UTERI. By Bache McEvers Emmet, M. D. 641

CHRONIC INVERSION OF THE UTERUS. By Samuel C. Busey, M. D., LL.D. 693

INJURIES AND LACERATIONS OF THE PERINEUM AND PELVIC FLOOR. By Howard A. Kelly, M. D. 719

THE TREATMENT OF OVARIAN AND OF EXTRA-OVARIAN TUMORS. By William Goodell, A. M., M. D. 779

PAGE

DISEASES OF THE OVARIES. By Robert Battey, M. D., and Henry C. Coe, A. M., M. D. 837

DISEASES OF THE FALLOPIAN TUBES. By Henry C. Coe, A. M., M. D., and W. Gill Wylie, M. D. 892

THE PATHOLOGY OF OVARIAN TUMORS By Stephen Y. Howell, A. M., M. D. 950

THE CLINICAL HISTORY AND DIAGNOSIS OF PELVIC TUMORS OTHER THAN UTERINE AND TUBAL. By Matthew D. Mann, A. M., M. D. 1050

DISPLACEMENTS OF THE UTERUS. By George T. Harrison, M. D. 1091

LIST OF WOOD ENGRAVINGS.

Fig.		Page
1.	Longitudinal and Transverse Section of Vaginal Wall	18
2.	Inflammation of Vagina	20
3.	Hymenal Atresia	25
4.	Atresia Vaginæ, seen from Behind	27
5.	Double Atresia	29
6.	Forceps Canula	32
7.	Perforated Glass Plug used in Operation for Atresia Vaginæ	33
8.	Emmet's Operation for Procidentia	39
9.	Emmet's Operation for Procidentia, folds after twisting first suture	39
10.	Emmet's Inside Operation for Diminishing Size of Vaginal Outlet	43
11.	Emmet's Operation for Procidentia, appearance at completion	44
12.	Hegar's Denudation for Prolapsus, Front View	45
13.	Section of Vaginal Cyst	57
14.	Removal of Vaginal Cyst by Schroeder's Method	58
15.	Ossifying Adenoid Fibroma, undergoing Carcinomatous Degeneration	205
16.	Transformation of Adenoma into Carcinoma	206
17.	Transformation of Fibroma into Sarcoma	207
18.	Section of Cystic Fibroma	211
19.	Section of Cystic Fibroma	212
20.	Section of Intracanalicular Fibroma	213
21.	Section of Intracanalicular Fibroma	213
22.	Section of Intracanalicular Fibroma	214
23.	Section of Fibroma	216
24.	Regions of Breasts most frequently affected by Fibroma	218
25.	Regions of Breasts most frequently affected by Fibroma	219
26.	Section of Small Round-Celled Sarcoma	227
27.	Section of Large Round-Celled Sarcoma	227
28.	Section of Lymphoid Sarcoma	228
29.	Section of Alveolar Large Round-Celled Sarcoma	229
30.	Section of Melanotic Alveolar Sarcoma	230
31.	Section of Small Spindle-Celled Sarcoma	231
32.	Section of Large Spindle-Celled Sarcoma	232
33.	Section of Giant-Celled Alveolar Sarcoma	232
34.	Fumigating Cystic Adenoid Sarcoma	236
35.	Myxomatous and Telangiectatic Cystic Small Spindle-Celled Sarcoma	240
36.	Section of Hyaline Myxoma	256
37.	Section Showing Development of Adenoma	262
38.	Section of Adenoma	263
39.	Solid Adenoma, showing Lobulated Outline	266
40.	Section showing Development of Carcinoma	269
41.	Section showing Extension of Carcinoma into Great Pectoral Muscle	271
42.	Section of Scirrhous Carcinoma	272
43.	Section of Atrophying Carcinoma	273
44.	Section of Atrophying Scirrhus	273

FIG.		PAGE
45.	Section of Atrophying Scirrhus	274
46.	Section of Encephaloid Carcinoma	275
47.	Section of Colloid Carcinoma	276
48.	Section of Colloid Carcinoma	276
49.	Cystic Encephaloid Carcinoma	277
50.	Transverse Section of Nipple showing Ducts Occupied by Proliferating Epithelium	283
51.	Scirrhus, showing Retraction of Nipple	286
52.	Local Dissemination of Scirrhus	288
53.	Local Dissemination and Ulceration of Scirrhous Carcinoma	290
54.	Section of Carcinoma of Mammary Gland	293
55.	Cellular Invasion of Tissues around a Carcinomatous Lymphatic Gland	294
56.	Atrophying Scirrhus of Right Mammary Gland	308
57.	Ordinary Method of Removing a Carcinomatous Breast	313
58.	Gross' Method of Removing a Carcinomatous Breast	314
59.	Mode of Approximating Edges when Wound cannot be Entirely Closed	316
60.	Multiple Retention Cysts	321
61.	Multilocular Retention Cyst	322
62.	Multiple Involution Cysts of the Breast	324
63.	Multiple Cysts of the Breast	327
64.	Development of the Lactiferous Ducts	336
65.	Development of the Lactiferous Ducts	336
66.	Smooth Muscle Fibre of Nipple	337
67.	Section of the Breast during Pregnancy	338
68.	Degeneration of the Mammary Epithelium at the Menopause	339
69.	Hypertrophy of the Breasts	343
70.	Cross Bandage of one Mamma	347
71.	Triangular Bandage Applied to the Bosom	347
72.	Cross Bandage of Both Mammæ	347
73.	Vessels Plugged with Cocci in Erysipelatous Skin	352
74.	Combined Effect of Atrophy and Induration of Breast	354
75.	Simpson's Splint in Place, Wires Fastened over Lower Bar	377
76.	Coghill's Wire Suture	378
77.	Baker Brown's Method of Fastening Suture	378
78.	Twisting Sutures and Appearance when Completed (Atlee)	379
79.	India-Rubber Suture	379
80.	Debouë's Flaps for Fistula	380
81.	Debouë's Flaps, Ends of Suture Secured, Two to a Button	380
82.	Debouë's Flaps, Method of Securing Odd Number of Sutures	380
83.	Debouë's Flaps, Position when Sutures are in Place	380
84.	Location of Various Forms of Fistulæ	385
85.	Sims' Operation for Fistula. Paring the Edges	394
86.	Sims' Operation for Fistula. Paring the Edges (Savage)	394
87.	Sims' Operation for Fistula. Bevelling the Edges	394
88.	Sims' Operation for Fistula. Bevelling the Edges, Second and Third Method	395
89.	Sims' Operation for Fistula. Direction taken by the Needle	396
90.	Sims' Needle-Holder with Needle	396
91.	Emmet's Needle-Holder	396
92.	Emmet's Method of Applying Counter-Pressure	397
93.	Emmet's Method of Supporting Sutures by the Fork	397
94.	Emmet's Method of Shouldering Sutures	398
95.	Twisting the Sutures	398
96.	Sims' Shield or Fulcrum	399
97.	Emmet's Twisting Tongs	399
98.	Sims' Sigmoid Catheter	399

FIG.		PAGE
99.	Sims' Self-retaining Catheter	399
100.	Skene's Modification of Goodman's Catheter	399
101.	Removal of Silver Sutures (Sims)	400
102.	Simon's Position for Vesico-vaginal Fistula	402
103.	Simon's Specula	403
104.	Incising Edges of Fistula, Immediate Access (Simon)	404
105.	Incising Edges of Fistula, Mediate Access (Simon)	405
106.	Sutures Tied (Simon)	406
107.	Bozeman's Securing Apparatus	409
108.	Bozeman's Self-retaining Speculum	410
109.	Various Forms of Fistula Knives, Forceps, and Scissors	411
110.	Bozeman's Needle-holder	411
111.	Bozeman's Suture-adjuster	412
112.	Bozeman's Button-shaper	412
113.	Bozeman's Button, Wire Passed Through	412
114.	Bozeman's Button, Adjusture	412
115.	Bozeman's Button Adjusted and Slot Compressed	412
116.		
117.		
118.	Bozeman's Buttons of Various Shapes	413
119.		
120.	Autoplasty by Flap taken from Recto-vaginal Septum	414
121.	Flap in Place (Le Roy d'Étiolles)	415
122.	Vesico-uterine Fistula	416
123.	Cervix Slit to Expose Fistula, Sutures Passed	417
124.	Vesico-utero-vaginal Fistula, Anterior Lip Pared	418
125.	Vesico-utero-vaginal Fistula, Sutures in Place	419
126.	Vesico-utero-vaginal Fistula, Posterior Lip Pared	419
127.	Posterior Lip United to Anterior Edge of Fistula	420
128.	Vesico-vaginal and Urethro-vaginal Fistula	421
129 and 130.	Bridging Over an Atresia and Closing a Urethral Fistula by Transplantation of Vesico-vaginal Wall	422
131.	Urethral Atresia Bridged Over	423
132 and 133.	人-shaped Line of Union in Large Fistula	425
134.	Cervix United to Neck of Bladder to Secure Retention	426
135, 136, and 137.	Jenks' Case of Urethral Fistula	434, 435
138.	Taylor's Case of Recto-labial Fistula	442
139.	Fecal Fistula Prepared for Closure	445
140.	Urethra of Woman aet. 40, Laid Open from Above	448
141.	Urethra of Girl aet. 9½	448
142.	Vertical Mesial Section of Fœtal Female Pelvis	450
143.	Skene's Endoscope	455
144.	Simon's Urethral Dilators	457
145.	Sinus Urogenitalis and Appendages (life size)	461
146.	Ectopia of Bladder and Epispadias in Female	471
147.	Emmet's Operation for Cystocele	482
148.	Emmet's Buttonhole Operation	484
149.	*a.* Healthy Vesico-urethral Membrane	503
	b. Hyperæmia of Vesico-urethral Membrane	503
150.	*a.* Healthy Bladder: Membrane Seen through Dilated Urethra	511
	b. Chronic Cystitis: Seen through Dilated Urethra	511
151.	Skene's Modification of Goodman's Catheter	517
152.	Baker's Urinal	519
153.	Interstitial Fibroid Tumor of Uterus	551
154.	Pediculated Subperitoneal Fibroid Tumor of Uterus	551

FIG. PAGE
155. Submucous Fibroid Tumor Projecting into Uterine Cavity 552
156. Section of Large Fibroid Tumor of Uterus 552
157. Section of Fibroid Tumor of Uterus 554
158. Structure of Fibroid Uterus 554
159. Large Fibroid Tumors in Anterior and Posterior Walls of Uterus 556
160. Ossified Fibroid Tumor of Uterus 558
161. Large Three-lobed Fibroid of Uterus 559
162. Subperitoneal Fibroid Tumor of Uterus, Pediculated 560
163. Submucous Fibroid Tumor 562
164. Intramural Fibroid Tumor of Uterus 563
165. Fibroid in Cervix Uteri 564
166. Fibroids Attached to Cervix in Vagina 565
167. Kuchenmeister's Scissors 577
168. Paquelin's Cautery 577
169. Sims' Dilator 578
170. Wilson's Dilator 578
171. Forms of Wire Écraseur 579
172. Aveling's Polyptome 580
173. Simpson's Enucleator 580
174. Sims' Sharp Curette 580
175. Thomas' Spoon Saw 581
176. Sims' Tumor Hook 581
177. Staffordshire Knot 582
178. Koeberlé's Serre-nœud 584
179. Tait's Wire Clamp 584
180. Wells' Forceps 587
181. Drainage-tube 588
182. Fibre of Endometrium and Grades of Corpuscular Development 592
183. Endometrium of Woman aet. 60 593
184. Endometrium of Woman aet. 20 593
185. Diffuse Papillary Adenoma of Body of Uterus 594
186. Glandular Polyp 595
187. Section of Channelled Polyp 596
188. Glandular Polypus 597
189. Mucous or Glandular Cervical Polypus 597
190. Cancer of Body of Uterus, Diffuse Form 603
191. Section through Cancer of Portio 604
192. Section of Adenoma Malignum 605
193. Carcinoma of Vaginal Portion of Uterus 606
194. Carcinoma of Cervix 607
195. Sewing Floor of Pelvis (Martin's Method) 623
196. Sewing Floor of Pelvis (Leopold's Method) 624
197. Doléris' Pressure Forceps 627
198. Polk's Needle 628
199. Baker's Method of High Amputation of Cervix 631
200. Diagram illustrating Use of Chloride of Zinc 633
201–208. Procedures in Treatment of Laceration of the Cervix 685–689
209. Inversion of Uterus 696
210. Uterine Polypus *plus* Partial Inversion 703
211. Uterine Polypus 704
212. Inversion of Uterus 704
213. Uterine Polypus 704
214. Replacement of Uterus by Dilatation through Abdomen 707
215. Inverted Uterus Drawn Down by Tape Noose 708
216. Rapid Reduction by White's Method 711

Fig.		Page
217.	Sigmoid Repositors Applied	712
218.	Emmet's Method of Reducing Inverted Uterus	713
219.	Reducing Inversion by Courty's Method	714
220.	Reducing Inversion by Tait's Method	715
221.	Diagram, showing Direction of Traction Exerted by Sutures in Cervix after Partial Reduction of Inversion (Emmet)	717
222.	Section, showing Actual Thinness of Normal Perineum	720
223.	Cross-section of Pelvis near Vaginal Outlet	724
224.	Diagram of Vaginal Outlet	724
225.	Outlet during Parturition; Head at Outlet	725
226.	Relations of Levator, Rectum, and Vagina	726
227.	Superficial External Tear of Perineum	727
228.	Old Superficial External Tear of Perineum	728
229.	Urethrocele	728
230.	Central Rupture of Perineum	729
231.	Relaxed and Normal Outlet Compared	731
232.	Relaxation of Perineum of Multiparous Woman	732
233.	Test, showing Functional Inactivity of Perineum	732
234.	Test for Relaxation of Perineum, shown in Fig. 232	733
235.	Test for Relaxation of Perineum	734
236.	Normal Outlet in Lateral Semi-prone Posture	734
237.	Rupture of Sphincter Ani	736
238.	Complete Tear of Sphincter Ani	736
239.	Disposition of Patient for Repair of Perineum	737
240.	Perineal Pad	738
241.	Recent Tear of Perineum	738
242.	Recent Inside Tear of Perineum and Repair by Sutures	739
243.	Recent Tear of Perineum Inside Vagina, and Suturing	740
244.	Object Attained by Suturing, shown in Fig. 243	740
245.	Direction of Needle in Repair of Perineal Rupture	741
246.	Bad Result of Passing External Sutures in Repair of Perineal Rupture	741
247.	Suture in Recent Inside Tear of Perineum	742
248.	Recent Tear through Sphincter Ani	744
249.	Introduction of Sutures in Tear through Sphincter Ani	744
250.	Complete Tear of Perineum	745
251.	Intermediate Operation for Perineal Rupture	747
252.	Points for Multiple Hypodermic Use of Cocaine	749
253.	Superficial External Tear of Perineum	749
254.	Method of Using Scissors in Denuding Perineum	750
255.	Closure of Wound by Werth's Buried Sutures	751
256.	Single Deep Sutures and Two Rows of Buried Sutures	753
257.	Rectal Tear up Septum	753
258.	Complete Tear, with Prolapse of Anterior Vaginal Wall	753
259.	Hegar's Operation for Complete Tear of Perineum	755
260 and 261.	Hegar's Operation for Complete Tear of Perineum: Method of Suturing	756
262.	Hildebrandt's Operation for Rupture of Perineum	758
263.	Staude's Operation for Rupture of Perineum	759
264.	Staude's Operation for Rupture of Perineum, Sutures in	760
265.	Voos' Operation for Rupture of Perineum	761
266.	Flap Method for Complete Tear of Perineum	763
267.	Complete Tear of Perineum Operated upon Eleven Times	763
268.	Method of Repair Adopted in Kelly's Cases	764
269.	Diagram, showing Fritsch's, Hegar's, Bischoff's, Simon's, and Emmet's Operations for Relaxation of Perineum	766

FIG.		PAGE
270.	Diagrammatic Relaxed Outlet and its Repair	766
271.	Relaxed at Outlet	767
272.	Fig. 271 at Rest	767
273.	Tear, showing Relaxation of Outlet in Fig. 271	768
274.	Hegar's Operation Foreshortened	769
275.	Leg-holder for Operation for Relaxation of Perineum	771
276. 277.	Denudation in Emmet's Operation for Relaxation of Perineum	771 772
278.	Crest of Rectocele Exposing Right Sulcus for Denudation	773
279.	Showing Sulci up which Denudation Extends in Fig. 278	774
280.	Diagram of Emmet's Operation for Relaxation of Perineum	775
281.	Relaxation, Separation of Fibres	775
282.	Appearance of Parts after Emmet's Operation	777
283.	Trocar with Elbow Attachment	785
284.	Wells' Trocar	798
285.	Hodge's Trocar	799
286.	Koeberlé's Pressure-Forceps	799
287.	Péan's Pressure-Forceps	800
288.	Staffordshire Knot	811
289.	Czerny's Suture	825
290.	Battey's Modification of Sims' Speculum	844
291.	Sims' Depressor	845
292.	Fenestrated Forceps	846
293.	Follicular Hemorrhage of the Ovary	853
294.	Hæmatoma of the Right Ovary	854
295.	Cirrhosis of Ovary with Pyosalpinx	868
296.	Atrophy of Ovary with Pyosalpinx	868
297.	Cut Surfaces of Cirrhotic Ovary	870
298.	Fibroid Hypertrophy of Ovary	870
299.	Moderate Cystic Enlargements of the Peripheral Follicles	873
300.	Section of Wall of Simple Cyst	876
301.	Section of Ovary showing Corpora Fibrosa	877
302.	Section of Small Corpus Fibrosum	877
303.	Section of Ovary showing Mucoid Masses	879
304.	Section of a Degenerated Follicle (Myxomatous)	879
305.	Prolapse of Ovaries	882
306.	Mundé's Ovarian Pessary	888
307.	Carcinoma of Tube and Ovary	894
308.	Double Hydrosalpinx	903
309.	Double Sacculated Hydrosalpinx	905
310.	Hæmatosalpinx	907
311.	Hydrosalpinx	923
312.	Hydrosalpinx with Atrophied Ovaries	923
313.	Atrophied and Contracted Tubes caused by Salpingitis	924
314.	Chronic Salpingitis and Cystic Degeneration of Ovaries	924
315.	Chronic Salpingitis, with Abscess of Ovary	925
316.	Tuberculous Salpingitis	926
317.	Tuberculosis of Tubes	926
318.	Pyosalpinx	927
319.	Section of Fœtal Ovary	951
320.	Section of Ovary of Newborn Child	953
321.	Ovary with Distended Follicles	958
322.	Bilateral Multiple Cystoma	958
323.	Simple Ovarian Cyst	959
324.	Multiple Ovarian Cystoma	961

FIG.		PAGE
325.	Hæmatoma of Right Ovary	963
326.	Proliferating Glandular Cystoma of Ovary	965
327.	Ovarian Cystoma in Process of Development	966
328.	Ruptured Secondary Cyst of Ovary	967
329.	Large Papillomatous Cyst of Ovary	970
330.	Section of Papillomatous Cyst of Ovary	970
331.	Section of Papillary Ovarian Cyst	972
332.	Papillary Cystoma of Ovary	974
333.	Superficial Papilloma of Both Ovaries	976
334.	Transverse Section of Ovary	977
335.	Colloid Degeneration of Stroma in Ovarian Cystoma	981
336.	Section of Proliferating Glandular Cystoma	985
337.	Development of Ovarian Cystoma	986
338.	Internal Wall of Glandular Cystoma	989
339.	Cyst Separated from Pedicle by Torsion	1007
340.	Diagram of Structures adjacent to Broad Ligament	1015
341.	Cyst of Parovarium	1017
342.	Wall of Ovarian Dermoid Cyst	1028
343.	Round-celled Sarcoma from Dermoid Cyst	1036
344.	Fibroma of Ovary	1039
345.	Section of Fibroma of Ovary	1040
346.	Encephaloid of the Ovary	1044
347.	Spindle-celled Sarcoma of Ovary	1047
348.	Alveolar Sarcoma of Ovary	1047
349 and 350.	Areas of Dulness in Ascites and Ovarian Tumor	1072
351.	Position of Uterus when Bladder and Rectum are Empty	1094
352.	Anteflexion produced by Cicatrization of Utero-sacral Ligaments	1101
353.	Retroflexion of Uterus	1111
354.	Prolapsus of Uterus and Vagina	1136
355.	Median Hypertrophy of Cervix	1143
356.	Supravaginal Hypertrophy of Cervix	1143
357.	Classification of Parts of Cervix	1144
358.	Figure of the Vagina in Transverse Section	1144
359.	Emmet's Operation for Procidentia	1148
360.	Folds formed after Twisting First Suture	1148
361.	Prolapsus of Inverted Uterus	1150

PLATES.

PLATES I. AND II.

Various Forms of Laceration of the Cervix uteri (Mundé) . . . . Facing 664

PLATE III.

Section of Mammary Gland, showing Lesions of Confluent Tuberculosis (Dubar) . . . . . Facing 362

PLATE IV.

Typical Cysts of the Ovary and Wolffian Remains (Coblenz) . . . Facing 998

THE DISEASES OF THE VAGINA.

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In this article the inflammatory and other diseases of the vagina, including neoplasms, which the practitioner is called upon to treat will be described in full, and the more important congenital and traumatic lesions, excepting fistula, will be treated under their appropriate heads.

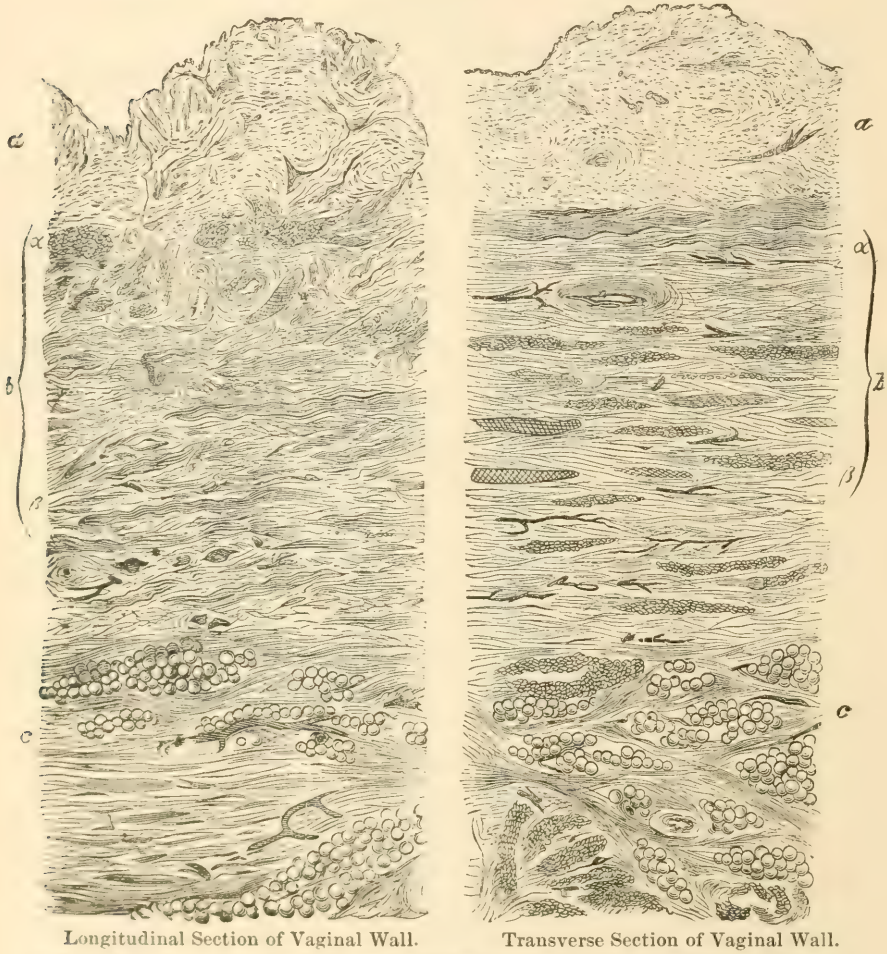
Anatomy.[1]—The vagina is a musculo-membranous canal which extends upward and forward from the vulva to the cervix uteri, which its upper extremity embraces. Its average length is 3.1 inches along the anterior wall, 3.9 inches along the posterior wall; its diameter varies from 1.3 to 2.6 inches. Its general shape has been compared by Savage[2] to that of a flexible tube diminished to nearly half its length by a string passed through one of its sides from end to end. The tense and slightly projecting ridge thus formed in front is called the anterior column of the vagina, and constitutes the vesico-vaginal septum. Its tension causes the surface to be thrown into transverse folds or rugæ. The posterior column consists of a less defined ridge running up the centre of the posterior wall. The walls, which are very elastic and distensible, are composed of three distinct coats or layers: 1, an external coat of fibrous elastic tissue, with connective tissue; 2, a middle coat of unstriped muscular fibres, longitudinal superficially, and extending from the external layer of the muscular coat of the cervix uteri, with which they are continuous, to the front of the ischio-pubic rami: beneath these is a layer of interlacing fibres, forming what Prof. Charpentier calls a "plexiform network;" 3, an internal or superficial coat of mucous membrane, pink or reddish in color, about one-fifth of an inch thick, intimately united with the muscular coat, and covered with strata of pavement epithelium, which overlies its papillæ and muciparous glands. Sappey and C. Robin have failed to find these glands, and deny their existence, but Huschka and Farre have discovered them in great numbers. The vaginal arteries and arterioles are derived from the internal pudic, the vesical, and from the hypogastric through the vaginal branch of the uterine. The veins

[1] See also article on "Anatomy" in Vol. I.

[2] *Anatomy of Female Pelvic Organs*, London, 1870.

originate in the papillæ, and terminate in the large lateral venous plexus which is found along either side of the vagina. Its nerves, which are much less sensitive than cutaneous branches, are derived from the hypo-

FIG. 1.



Longitudinal Section of Vaginal Wall. Transverse Section of Vaginal Wall.

a, mucous membrane; *b*, muscular layer, including (*α*) circular and (*β*) longitudinal fibres; *c*, fibrous layer, containing fat (Breisky).

gastric plexus. The vaginal lymphatics empty into the large glands on either side of the pelvic cavity, and finally into the inguinal glands.

The functions served by the vagina are to give passage to the menstrual flow and to the fœtus during parturition, but chiefly as an organ for coition.

VAGINITIS.

By vaginitis is meant inflammation of the mucous membrane of the vagina, which, as elsewhere, may be acute, subacute, or chronic. Its

synonyms are colpitis, elytritis, and, in the older works, blennorrhœa and blennorrhagia. Its varieties are: I. Simple vaginitis, or catarrhal vaginitis; II. Specific vaginitis, "gonorrhœal;" III. Aphthous or diphtheritic vaginitis; IV. Granular (glandular, papular) vaginitis, very rare. But as it is absolutely impossible by any clinical signs to distinguish specific vaginitis or gonorrhœa in women from simple vaginitis of an acute or virulent grade, the two will be described together.

This may seem a bold statement to advance. The most careful systematic writers make, it is true, an attempt to differentiate between these two conditions. Thus, Thomas[1] emphasizes the "great virulence and acuity of development," the "marked urethral complication," "copious purulent discharge," "transmission to the male from coition," etc., as indicative of *specific* vaginitis, but in the next sentence admits that these symptoms "will exist in cases certainly of non-specific character. On two occasions I have seen them all attend cases of vaginitis, excited by accidental contact of chromic acid with the vaginal walls."

Dr. Jenks,[2] after stating that specific vaginitis "more frequently than other varieties is liable to give rise to violent urethritis, cystitis, salpingitis, ovaritis, and pelvic peritonitis," admits that "it is sometimes not only difficult, but quite impossible, to determine whether a case be one of simple inflammation or of gonorrhœal origin." Edis[3] is so doubtful as to diagnosis that he thinks it our duty "always to lean to the side of charity when the question is one of chastity." Dr. J. W. White,[4] in an excellent review of the question in its bearing upon gonorrhœa, concludes by the assertion that "it is never safe or proper to say that a given urethritis, vaginitis, or vulvitis has resulted from impure sexual intercourse." Dr. Matthews Duncan,[5] in discussing simple and specific vaginitis, says, explicitly: "You cannot decide absolutely whether a case is venereal or not. . . . . I have seen cases which were certainly not venereal bear every character of the ordinary venereal disease. I do not say there is no distinction, but only that the distinction cannot be made out by the practitioner so as to justify him, from his own inquiries into a case, in giving a decided opinion on the subject."

Some years ago, when I had charge of the large venereal wards in the (New York) Charity Hospital, I made very numerous and careful clinical examinations to test the possibility of this distinction, with exceptional facilities for such an object. The result was absolutely negative. Since then a like inference has resulted from equally careful observation of my cases in the Woman's Hospital and in private

[1] *Diseases of Women*, 1880, p. 216.
[2] *Pepper's System of Medicine*, 1886, iv. 371.
[3] *Dis. of Women*, Am. ed., 1882.
[4] Ashhurst's *International Encyc. of Surgery*, ii. 329.
[5] *Med. Times and Gazette*, June 26, 1880.

practice. That gonorrhœa, either in man or woman, is a "specific" disease, in the proper sense of specificity, I do not believe; nor is it easy to comprehend how any pathologist can hold that view in the light of our present knowledge.[1] That a simple virulent vaginitis can be distinguished from one of "gonorrhœal" origin I equally disbelieve; and it needs but a moment's reflection to perceive the vast importance of this in its bearing upon the happiness of the families we may be called upon to advise. The obvious inference each reader can draw for himself.

Etiology and Pathology.—The common causes of simple vaginitis in the adult are exposure to cold and wet, irritating or over-stimulating vaginal injections, the misuse of pessaries, excess of coition, as in newly-married women or among prostitutes, retained or decomposing secretions, gonorrhœal infection from the male urethra, and certain diseased blood-states, as the exanthematous eruptions. In children and young girls more or less acute attacks of vaginitis are also excited by ascarides passing from the rectum into the vagina, by want of cleanliness, exposure to cold, and as a sequence of scarlatina and measles. In the aged it occurs sometimes in connection with atrophy of the uterus, and is thought by Hildebrandt and Jenks[2] to be due to the retrogressive processes which physiologically follow the menopause. In such cases the epithelium sometimes sloughs in large patches, and adhesion of the raw surfaces with practical atresia of the vagina ensues.

The pathological changes are those that characterize inflammation of all mucous membranes. The surface at first becomes highly vascular and bright red from distension of the arterioles; it is dry, glistening, and tender; the epithelium gives way in patches and is detached, the

Fig. 2.

Inflammation (simple) of Vagina (Ruge).

raw surface either bleeding if subjected to friction, or exuding a muco-pus, or, during epidemics of diphtheria, being quickly covered with a grayish diphtheritic deposit. More rarely, an epithelial cast or mould of a large section of the vagina, possibly of the whole canal, is thrown

[1] See, inter alia, White, *loc. cit.*, pp. 326 *et seq.*, for a full and lucid statement of this subject.

[2] *Loc. cit.*, p. 368.

off spontaneously or is washed away by the vaginal douche. Thomas[1] likens this "to the dysmenorrhœal membrane which is occasionally expelled from the uterus." These changes may begin in any portion of the canal, but usually commence near the vulva.[2]

After about twenty-four hours a secretion of muco-pus exudes from the congested surface, to be quickly followed by a more acrid and offensive pus in copious amount. When retained in the upper vagina this soon undergoes decomposition, becomes greenish, and excoriates all the mucous surface with which it comes in contact. In one or two weeks, if no treatment be applied, this secretion again becomes muco-purulent, more benign in character, and less copious; and in this condition it remains in feeble constitutions for many months.

All samples of decomposing pus from cases of vaginitis contain bacteria; but whether these be called the "Trichomonas vaginalis" of Donné, or the "gonococcus" of Neisser, E. Bumm, and Noeggerath,[3] is immaterial, as they are not pathognomonic of any form of vaginitis.

In any case, but chiefly when the last stage is neglected, these inflammatory processes may, and sometimes do, extend by simple continuity of surface through the uterus into the Fallopian tubes, to the ovaries and pelvic peritoneum, into the vulvo-vaginal glands, and, more rarely, into the urethra and bladder. True cystitis as a result of and form of vaginal inflammation, although often spoken of, is uncommon.

Symptoms, Duration, and Prognosis.—Vaginitis is rarely seen by the physician in its very earliest stages. In acute cases the labia are found swollen and tender; the ostium vaginæ bulging and full, especially noticeable where any prolapse of the vagina coexists; the surface of the canal bright red or dusky red, bathed with pus, hot, and somewhat throbbing to the touch. If the walls be gently separated, a more copious flow of yellow and somewhat fetid pus will occur, and with the aid of a speculum these conditions will be seen to have extended to the cervix. The latter is also commonly swollen, turgid with blood, while the os is often occluded with a thick plug of tenacious mucus. The vaginal surface is usually very tender to the touch, often exquisitely so, and in a few cases a thorough examination is impracticable without anæsthesia. Sensitiveness is commonly greatest at the

[1] *Op. cit.*, p. 213. [2] Compare Eppinger in *Zeitschrift f. Heilkunde*, iii. 177.

[3] Although I deny that any clinician can diagnosticate a case of simple vaginitis from one "of gonorrhœal origin," and also that gonorrhœa is a specific disease as distinguished from other forms of acute urethral inflammation, I by no means question the accuracy of Dr. Noeggerath's views as to the frequency of salpingitis, occlusion of the tubes, ovaritis, perimetritis, and consequent sterility from women being contaminated by urethral discharges in their husbands. How far this *materies morbi* may remain *latent* (*vide Die Latente Gonorrhœa im Weiblichen Geschlecht.*, Bonn, 1873, and *Trans. Am. Gyn. Society*, i. 268 *et seq.*) in the man, as Noeggerath claims, I cannot say; but every year's observation the more convinces me that, in his main contention, that learned writer is correct.

vulva, often with much itching or pruritus, and, in most cases, vulvitis complicates the vaginal inflammation. Dysuria is more often due to the scalding effect of acid urine upon the inflamed fourchette than to true urethritis.

The duration of such an attack is usually from two to three weeks in its acute form; in a subacute or chronic state, as a muco-purulent leucorrhœa, it may last indefinitely.

The prognosis, with rest and proper treatment, is always favorable in acute cases, but chronic vaginitis in tubercular or otherwise cachectic subjects will often baffle all efforts to cure it. The complications of serious import are, as already implied, vulvitis, inflammation and abscess of Duverney's glands, endometritis, inflammations of the uterine appendages, and peritonitis.

Treatment.—Rest, cleanliness, astringent douches, separation of the vaginal surfaces,—these are the cardinal indications for treatment.

The patient must, in the acute stage, be kept in bed, for without the maintenance of complete rest and the recumbent position very little can be attained. The bed-covering should be as cool, especially at night, as is consistent with safety and comfort. If there be fever, mild diaphoretics and saline cathartics should be used, and in all cases the rectum and colon should be kept free from fecal accumulations. If there be much pain, which is rare, anodyne (rectal) suppositories may be used after the laxative has acted; but the distress accompanying vaginal examination or applications can best be relieved by a 4 per cent. solution of cocaine hydrochlorate. At regular intervals—every few hours I am accustomed to direct—a copious and carefully administered vaginal douche of hot water should be administered. In hospitals and where the patient can have a nurse or even an intelligent family attendant this should never be done by the patient herself; for it is fatiguing, and obviously liable to cause her to become chilled in arranging and rearranging the apparatus. When travelling, or when, for any reason, it is quite impossible to obtain other assistance, the alternatives described by Prof. Palmer in the first volume of this work (pp. 556 *et seq.*) may be used with advantage, and to these the reader is referred. After the first intensity of the attack is thus subdued—in about forty-eight hours—it is generally recommended that the patient be placed on the left side, the vagina gently exposed with a Sims speculum, and the whole surface carefully painted with a solution of nitrate of silver, from ℈j to ʒj to ℥j strong. This I have faithfully done many times, and with others can aver that it very markedly diminishes the distressing sense of burning and constriction in the vagina. But I have never seen a case cured by it (by repeated applications, I mean) or perceptibly advanced toward a cure. I would use it, therefore, only where the discomfort just noted is a marked feature. But usually a

more efficient plan will be the following: Retract the posterior wall very gently with a Sims speculum—in the semiprone position, and using cocaine freely if need be—and, after washing out the vagina carefully with a weak disinfectant (mercuric bichloride solution, 1 : 5000, or solution of carbolic acid, 1 : 100), apply a sufficient number of strips of lint, cut one inch wide by six inches long and soaked in a weak astringent solution, to completely cover the vaginal surface. In this the position of the speculum must be shifted once, but that is easily accomplished. The lint may be saturated with either a solution of muriate of ammonia, ʒij to Oj, or boracic acid, ʒj to Oj, with or without a pinch of chloride of sodium, or tannin ʒss to Oj, or the same amount of alum; alum, however, is often harsh and irritating, and tannin less useful than the other astringents. The strips of lint should project at least a half inch from the vulva, and are to be left *in situ* for twenty-four hours. When removed, the douche is to be repeated, then the disinfectant lotion and the lint dressing applied as before. Cotton, either absorbent or non-absorbent, is less manageable, and should not be used if good "English" sheet lint can be had. After the third daily dressing of this kind the vaginal surface should be carefully dried (with absorbent cotton and without rubbing), and thoroughly dusted with iodoform powder before the soaked lint is applied; this is excellent, but I have not found an entirely dry dressing to answer so well. Dr. Engelmann, however, strongly advocates its use.[1]

In the great majority of severe cases one week, or at most ten days, of this treatment will be found to effect an absolute cure. When large strips or casts of the epithelium have been completely lost, an additional week will be needed. Abstinence from coition and especial cleanliness with tepid douching during menstruation should be enjoined for a month after recovery, for few maladies are more likely to relapse.

In aphthous, croupous, or diphtheritic vaginitis, first described by Rokitansky, which commonly occurs when the patient is developing or recovering from diphtheria, or in diphtheritic epidemics or in puerperal septicæmia, the conditions previously described all exist, plus a local diphtheria. As patches of epithelium exfoliate, grayish deposits of diphtheritic membrane take their place; these quickly extend until, within forty-eight hours, most of the canal is covered with this deposit. Much constitutional disturbance occurs, with feeble pulse and high temperature.[2]

The treatment is as in simple acute vaginitis, with the stimulation and tonics essential in all diphtheritic disease. Vaginal douches of a weak solution of sulphite of soda (ℨj to Oj) and its more concentrated

[1] *Amer. Journ. Obst.*, June and July, 1887.

[2] In an epidemic of puerperal septicæmia in the lying-in department of the N. Y. Foundling Asylum in 1884, I have seen it complicate every successive case that occurred.

application with the lint tampon (ʒij to Oj) have seemed to me of more benefit than anything else. In puerperal cases the tampon is of course omitted.

Granular or Follicular Vaginitis, which is chiefly due to the general venous stasis of the blood caused by the pressure of advancing pregnancy, is so rare as to be almost a medical curiosity. Deville first termed it "vaginite granuleuse;" and, as its name implies, its chief characteristic is the minute papillary or "granular" elevations which stud the surface of the vagina. In the few imperfectly developed cases I have seen (three in number, all in late pregnancy) these have been dusky red in color, attended with much itching and burning, and exuding a thin muco-purulent discharge. Dr. Thomas mentions a more striking case he once saw in consultation where the vaginal surface simulated malignant disease. The treatment is as for simple vaginitis. In pregnancy it rarely disappears completely until after confinement.

Learned German authors make many other subdivisions of vaginitis, such as vesicular, emphysematous, exfoliative, septic, erysipelatous, and dysenteric vaginitis;[1] but into these it is unnecessary to enter in a short practical treatise like the present.

Malformations.

Under this heading are generally included—

a. Congenital absence of the vagina;
b. Atresia, congenital or acquired;
c. Cicatricial bands;
d. Double vagina.

Complete absence of the vagina is, fortunately, extremely rare, and when it does occur it usually accompanies absence or rudimentary development of the uterus and ovaries. Such a condition is always an arrest of development, from failure of union or coalescence of the ducts of Müller. In the embryo these make their appearance on the front of the Wolffian bodies from the fourth to the sixth week. Superiorly, they remain separate as the Fallopian tubes; inferiorly, they unite to form the uterus and vagina. Imperfection of this union results, in accordance with its degree, in non-development or imperfect development of these organs.[2]

[1] *Vide* Chiari: *Zeitschrift f. Heilk.*, 1885, vol. vi. p. 81; and Breisky, in Grandin's *Cyclop. Obst. and Gyn.*, x. 328, 1887, rearranged from his *Krankheiten der Vagina*, Stuttgart, 1879, and his monograph in *Billroth's Handbuch der Frauenkrankheiten*, Band iii., 1887.

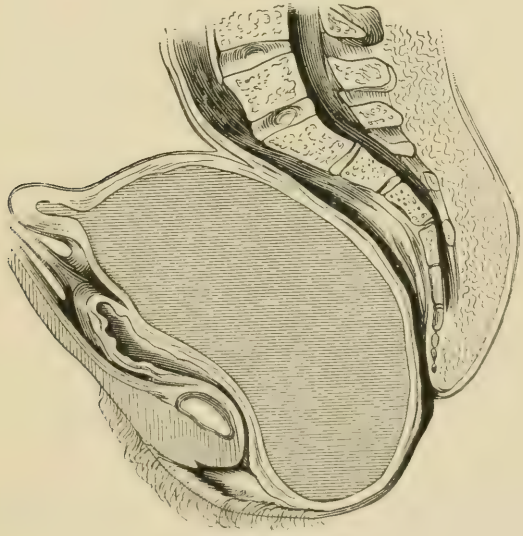
[2] Leuckart (*Med. Zeitung*, München, 1852, vol. i. part 1, p. 1) and Thiersch (*ibid.*, vol. i. part 2, p. 69) originally demonstrated this development in the mammalian embryo, and all subsequent writers have accepted their conclusions as applied to the human fœtus (*vide* Breisky: *Cyclop. Obst. and Gyn.*, x. 211).

Atresia (*α*, privative, and *τρησις*, a perforation) of the vagina signifies occlusion of that canal; it varies from a thin fibrous diaphragm to complete obliteration of the vagina; it may occur at any point of the vagina, but is most commonly found in its lower third. Most systematic authors distinguish its varieties as atresia hymenalis, atresia vaginalis, atresia cervicis.

The normal anatomy of the hymen has already been fully described (Vol. I. pp. 117, 118).

I. Atresia of the Hymen is caused by inflammatory adhesion of the folds of this membrane after their formation during fœtal life, and may be said to be always congenital. In common with other forms of congenital atresia, it excites no symptom or suspicion of its existence until puberty, when the non-appearance of the menses leads to its detection; then an examination shows the hymen to be a continuous membrane, impervious, thick, and almost cartilaginous[1] in consistency. As menstrual blood gradually accumulates in the pelvis a tense and bulging appearance of the hymen is presented. By this time

Fig. 3.



Hymenal Atresia (Breisky).

the vagina itself is full, and has formed a distended sac which nearly fills the pelvis. The uterus as yet may, however, be unaffected, as it only begins to fill and distend after the vagina has reached its utmost limit. This capacity varies in every case, and rupture of the thinnest part of the vaginal wall or of the cervix may occur in the process.

[1] *Vide* Hart and Barbour: *Man. of Gyn.*, 3d ed., p. 484, for the best account of this subject.

When in this condition hæmatosalpinx also occurs. Schroeder thinks the latter is generally due to a hemorrhage from the lining membrane of the tube itself, and not to simple reflux from the uterus. He has more than once removed a hæmatoma of the tubes under these circumstances where the uterine end of the tube was undilated or quite closed. Finally, the retained blood may pour out through the fimbriated extremity of the tube, causing pelvic hæmatocele or peritonitis, or both.

The SYMPTOMS have been indicated in the foregoing statement. Menstruation is completely suppressed, although the molimina may regularly recur, and the patient suffers from constant discomfort due to pelvic pressure, with occasional bearing-down pain. Micturition and defecation may be interfered with. These symptoms should always lead to a digital examination, when the hymen will be found closed and bulging, as above stated, while the finger in the rectum shows the vaginal space to be occupied by a tense, elastic, fluctuating tumor.

The PROGNOSIS of simple hymenal atresia with proper treatment is always favorable, unless symptoms of intrapelvic hemorrhage have already occurred. But the imperative necessity for surgical interference must be impressed upon the patient and her friends.

The TREATMENT consists in puncturing the hymen with a bistoury or trocar, or by galvano-caustic knife, as recommended by A. R. Simpson, and slowly evacuating the imprisoned blood.[1] Counter-pressure upon the abdomen must be avoided, for it is thought important that the womb should empty itself slowly to avoid the risk of tearing loose such adhesions as may have formed between the Fallopian tubes and adjacent tissues by the rapid descent of the contracting uterus.

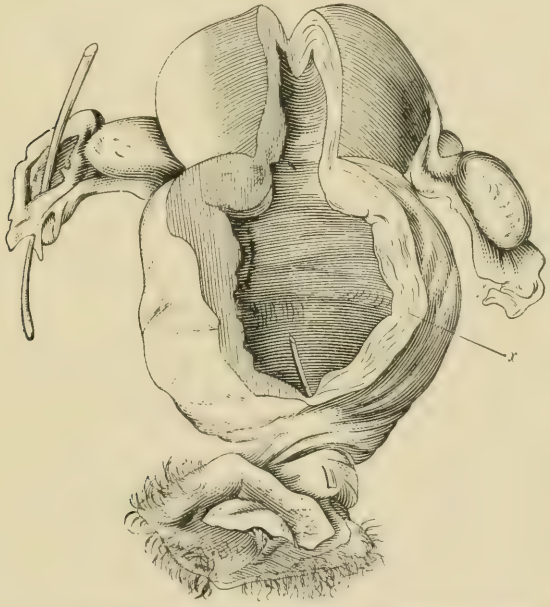
After this drainage is completed the hymen is to be completely divided by crucial incision or entirely dissected out, which may be effected at a second sitting if preferred; the vagina and uterine cavity should be gently irrigated and thoroughly washed out with warm carbolized water, and a tampon of lint or cotton soaked in carbolized oil maintained in the vulva for a few days, although changed daily. The patient must remain in bed until all danger of pelvic complications has subsided, usually about a week.

II. VAGINAL ATRESIA proper may be either complete or incomplete, and either congenital or acquired. The most common form is the incomplete variety, in which the obstruction exists in the middle or in the lower third of the vagina. Here the canal is found obliterated by a dense fibrous band, of which more than one are occasionally found, or a thick annular constriction occurs in its stead. Upon a basis of connective tissue this consists of muscular fibres covered with mucous membrane like the vaginal wall, with which it is continuous. It simulates a shallow cul-de-sac, but from this it may always be dis-

[1] Emmet advises free and rapid incision, and has met with uniform success.

tinguished by rectal examination, which reveals a pouch above it, and beyond this the cervix. In proportion to its thickness or extent this approximates the condition of complete atresia or entire obliteration of the vagina. In the latter condition imperfect development of the uterus is apt to be associated with it. When the obstruction is situated very low, just above the hymen, the latter is often spread out like a fringe upon the protruding mass, but there is no less bulging into the vulvar orifice than in hymenal atresia.

FIG. 4.



Atresia Vaginæ, seen from behind. Thickness of obstruction (through which probe is passed), 3–4 mm.; of vaginal wall below atresia, 2–3 mm.; above it (at *x*), 6 mm. Dilatation of the body of the uterus is small compared with the common cavity formed by cervix and upper portion of vagina. Left Fallopian tube markedly dilated, with no distinct flexion in it, and changed at its free end into a thin-walled blood-sac which had burst. Right tube undilated (Breisky).

The SYMPTOMS in such cases are practically the same as those that characterize atresia of the hymen, but the physical signs differ in one important point. Rectal touch, which is our sheet-anchor in differentiating all forms of atresia, indicates the vaginal tumor when the obstruction is low, or, in its place, the cord-like induration which occurs when the vagina is entirely absent. The latter may coexist with a perceptible but rudimentary uterus, which is a valuable guide toward operative interference.

The PROGNOSIS is always more serious in proportion as the atresia tends to complete obliteration of the canal, and to the degree of ute-

rine distension caused by retained blood; if the latter be considerable, it is always grave.

In hymenal atresia it is generally favorable, as we have already seen; in acquired atresia of the vagina proper it is often equally so.

In congenital cases the density of the tissue between rectum and urethra, and the possibility of dissecting a channel through it which shall serve as a vagina, will determine the prognosis. This difficulty, and the danger to the patient from rupture of the uterus or Fallopian tubes, and remotely from septic infection, should always be stated to the patient's family.

Treatment.—From surgery alone can we hope for any relief in atresia of the vagina, for the only treatment consists in the formation of a new canal through which the uterine contents can escape. Where this can be effected by removing simply a membranous band or a diaphragm of tissue, however thick, which occludes a partially-formed vagina, the task is comparatively easy. I have now under occasional observation a patient, twenty years of age, who more than a year ago entered my service in the Woman's Hospital with this form of incomplete atresia of the vagina. Menstruation, since its inception, had been prolonged, very painful, and attended by a dribbling flow, and increasing discomfort convinced her mother that she had some uterine disease. Rectal examination revealed a well-developed uterus and uterine appendages, while more than an inch below the cervix the vagina terminated in a cul-de-sac with a minute central aperture, through which the finest probe could scarcely be passed. When this was enlarged by circular incisions, the atresic diaphragm was found to be nearly half an inch thick and very vascular and elastic. The vaginal walls above this were quite smooth and normal. Deep incisions extending at short intervals to the overstretched vaginal wall, with subsequent dilatation, proving ineffectual, the patient was again etherized after a month's interval and the entire obstructing mass dissected out; and after applying a few catgut ligatures an aseptic tampon was applied and the extensive surface that had been denuded was left to heal by granulation. This process was slow, from the necessity of constantly maintaining effective dilatation, but by degrees it resulted in obtaining a perfectly formed vagina. In the rather large class of cases of which this is an example it may be laid down as a rule that it is always better to dissect out the atresic band at once, great care being taken not to encroach too closely upon the bladder or rectum.

If two or more obstructions of this kind be found, turning the vagina into a succession of pouches, the rule in operating will be exactly the same. When the diaphragm is completely impervious, imprisoning the retained menses, it may first be punctured by an exploring needle or a hypodermic syringe be used to assure us of the contents of the

sac; after which a crucial incision should be made, the sac exhausted and washed out with carbolized water, and the atresic membrane then or afterward dissected out as before. Whether atresias of this class be traumatic or congenital, their treatment is identical. Many interesting cases which illustrate these several varieties of atresia will be found narrated in detail in the important monograph of Breisky[1] to which reference has already been made.

FIG. 5

Case of Double Atresia. The lower affects the hymen, and was acquired; above this was a cavity one inch long which contained purulent débris: the upper obstruction was one inch thick and was congenital; above it is the dilated uterus and cervix. The Fallopian tubes contain blood-sacs with small rents in their walls (Breisky, case reported by Steiner).

Analogous cases of traumatic origin, or due to puerperal ulceration or diphtheritic or erysipelatous sloughing of the vagina, have been recorded by Bourgeois, A. Martin, Renouard, L. Mayer, Hennig, Nélaton, Trask,[2] Lombard,[3] Mattheyssen,[4] Levy,[5] and Boivin and Dugés. In Dieffenbach's works[6] will be found a full account of his observations and studies, to which surgeons of the present day are so much indebted; and, finally, in the learned monograph of Dr. A. Puech, entitled "Complex Atresias of the Female Genital Passages,"[7] a mine

[1] Grandin's *Cyclop. of Obst. and Gyn.*, x. pp. 231 *et seq.*

[2] *Am. Journ. Med. Sci.*, July, 1868.

[3] *Gaz. méd. de Paris*, i. 831.

[4] *Ann. de Méd. Belg.*, Aug., 1835.

[5] *Bibl. für Laeger*, 1860, p. 39.

[6] *Oper. Chirurgie*, i. 660 *et seq.*

[7] *Ann. de Gynécologie*, Paris, 1875.

of information exists of which most subsequent writers have liberally availed themselves. In this country, besides the many observations of single cases in journalistic literature, American gynecologists are especially indebted to an exhaustive article by Prof. I. E. Taylor on "Atresia of the Vagina" in the *Trans. Amer. Gyn. Society* for 1879, and to the classical chapters on this subject by Thomas[1] and Emmet[2] in their respective works. The latter tabulates twenty-two cases of various forms of atresia occurring in his own practice—in itself a remarkable experience—and analyzes many of these in a most instructive manner. Dr. Chadwick of Boston has also published a series of valuable cases of atresia and stenosis of the vagina.[3]

Complete Obliteration or Absence of the Vagina.

Here an entirely different plan of operation must be adopted. When complete closure occurs, the line of the canal will be indicated by a tense fibrous cord more or less distinctly perceptible from the rectum; when entirely absent no guide of any kind exists. In such cases arrested development of the uterus and ovaries, or their entire absence, usually coexists, but this is not invariably the case. Their presence is commonly held to be the justification for attempting to make a new vagina. When no trace of these organs can be found the general consensus of surgeons has discountenanced the operation. When rudimentary—even if a trace of uterus can be found—Dr. Emmet holds that the attempt should be made, and cites cases in which "nature had evidently delayed the development of puberty in consequence of an occlusion," and where the uterus was subsequently developed after previous failure to discover its presence.[4] Without attempting to criticise the objections made to this by Puech,[5] Gross, Ashhurst,[6] Roubeaud,[7] and others, I think we may safely follow the rule laid down by Thomas, who says: "It should be resorted to (*a*) if menstrual blood be imprisoned; (*b*) if a uterus can be distinctly discovered and the patient be suffering from absence of menstruation; (*c*) if the necessity for sexual intercourse be imperative."[8] The operation in such cases is as follows:

After emptying the bladder and thoroughly evacuating the rectum, the patient is anæsthetized and placed in the lithotomy position. A curved steel sound is passed into the bladder, and is held by an assistant with the point upward. A second assistant aids the first in retracting the labia, which are usually well developed, and manages the sponges. The surgeon makes a superficial incision, either vertical

[1] *Diseases of Women*, 1880, p. 220. [2] *Prin. and Pract. of Gynecology*, 1884, p. 188.
[3] *Boston Med. and Surg. Journal*, June, 1886. [4] *Op. cit.*, p. 189.
[5] *Loc. cit.* [6] *Prin. and Pract. of Surgery*, 1871, p. 943.
[7] *Traité de l'Impuissance et de la Stérilité*, p. 43. [8] *Op. cit.*, p. 227.

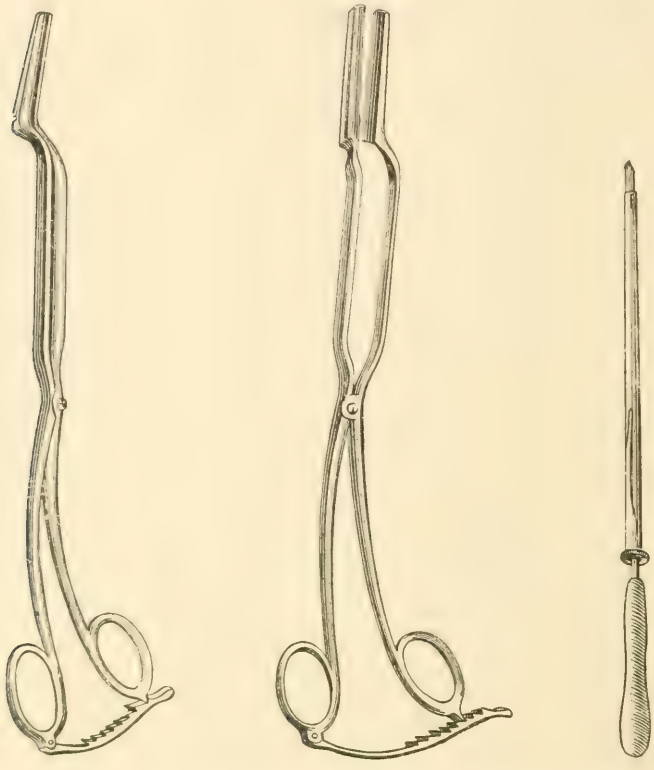
(Emmet) or semilunar with concavity upward (De Sinéty), midway between the urethra and the anus. Then, introducing his left fore finger into the rectum, the dissection is cautiously continued with knife or scissors for a short distance; but as soon as practicable the right fore finger is substituted, and with this the tissues are cautiously pressed and torn apart in the direction occupied by a normal vagina. While this line should be the aim of the operator, too close approximation to the sound in the bladder or the rectal finger must be carefully avoided. We owe to Amussat,[1] who followed the lead of Dupuytren,[2] this comparatively safe and facile method of forming the new canal; but, unlike him, we try to complete the entire operation at one sitting, as urgently advised by Emmet. Repetitions of the procedure in small sections expose the patient to needless discomfort and risk of septicæmia. Whenever fibres or bands of tissue are encountered too dense for the finger, they are cautiously snipped with blunt-pointed scissors or divided by the knife-point. In this manner, constantly bearing in mind his rectal and vesical guides, the operator gradually reaches the cervix or the blood-sac (if either exists), and punctures this with an exploring needle or trocar. In retention cases, before this is done, careful palpation is employed to ascertain, if possible, the region of the cervix, which can sometimes be felt as a soft depressible round spot in the tumor-wall. To effect the opening Breisky[3] uses an ingenious lancet-shaped knife concealed in a canula; the latter is pressed against the selected spot, the canula drawn back, the knife pushed on into the tumor, and the puncture enlarged by bilateral incision. Then the knife is withdrawn, while the canula is pushed on into the opening and held there, and a so-called "forceps canula" is passed over it. This exactly fits the first tube, and consists of "a canula split into two halves, to which a strong double-curved dilatation forceps has been added." With this the opening is thoroughly stretched, and, while the forceps is held open by a catch, the jaws are opened with as much force as may be needed. This permits the retained blood to escape at the surgeon's option, and when that is effected a silver tube is slipped through the jaws of the forceps canula and retained for purposes of drainage and antiseptic injections. In this manner dilatation is effected at one sitting, and a modified cervical canal permanently secured. The silver drainage-tube—for which any effective form of catheter could be substituted—is of course left *in situ*.

Breisky reports seven cases of broad atresia or obliteration of the vagina operated on in this manner, and the method commends itself as the best within our reach; but it must never be forgotten that no two of these cases are alike, and that he will best succeed who is constantly

[1] *Gazette méd.*, Dec. 12, 1835. [2] *Vide* Courty: *Mal. de l'Utérus*, 1866, p. 381.
[3] *Loc. cit.*, pp. 249–251.

prepared to modify his procedure as necessity demands. Should embarrassment occur as to the location of the cervix, as the surgeon thinks he has reached it or may be going too far, careful conjoined palpation between the rectum and the abdominal surface will usually determine its position. When the uterus or blood-sac has been emptied, suppos-

FIG. 6.



A B C

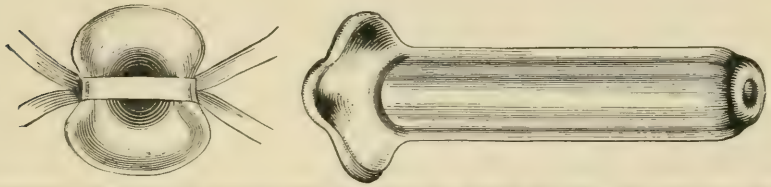
Forceps Canula: A, closed; B, open; C, Trocar Knife (Breisky).

ing retention to exist, careful but thorough washing out of the cavity must be effected; for this purpose weak solutions of carbolic acid—2 to 5 per cent.—or of listerine, or of thymol, or of iodine, should be preferred to the mercuric bichloride, which is never quite devoid of danger; and the injection should be used with extreme gentleness, as the Fallopian tubes are often patulous.

In the after-treatment the patient is to be kept in bed for a week or ten days, and the vagina kept distended by a Sims glass vaginal plug. Instead of this, a temporary aseptic tampon or strips of lint soaked in carbolized oil may be used for the first twenty-four hours, but they have no practical advantage. The Sims vaginal plug as generally

made and used in New York is very defective: it should be of thick glass, carefully annealed to prevent the possibility of fracture, always perforated at the end to permit drainage, with the edge of the perforation well rounded, and fenestrated or indented at the rim to secure its retention by tapes. The vulvar end must be grooved to correspond

FIG. 7.



Perforated Glass Plug to be used after Operation for Atresia Vaginæ. The left-hand figure shows the external end of the tube with the tapes attached (Hart and Barbour).

with the urethra. The plugs should be of regularly graduated sizes, long enough to project half an inch from the vulva without forcibly distending the vaginal cul-de-sac, and thick enough to thoroughly fill the new canal and slightly to stretch it. The plug must at first be worn daily for as long a time as the patient can tolerate its presence, even if a small amount of morphia or some nerve-sedative be necessary to aid her in this. After cicatrization is effected it should be employed only at night, a slightly thicker dilator being occasionally tried to make sure that contraction of the canal is not occurring, for this is very insidious. After a few weeks the dilator may be used every second day, and so at gradually increasing intervals; but for one or two years such cases should be kept under occasional observation to make sure that recontraction does not occur. Before and after using the plug a warm antiseptic vaginal douche should be taken. Breisky objects to permitting the patient to use the dilator herself; but the above rule is that uniformly followed in this country, nor have I ever heard of a case where it was supposed to have engendered a tendency to self-abuse.

Stenoses of the vagina, which are always minor degrees of atresia, whether congenital or acquired, are so identical in their pathogeny and treatment with atresias, that a separate discussion of them is superfluous.

CICATRICES OR CICATRICIAL BANDS.

This malcondition, which is rarely described or even alluded to in systematic works on gynecology, is of much interest to the practitioner, both from its frequency and the difficulty of treating it. In the first volume of the *Trans. of the American Gynecological Society* will be found an important paper upon it by Prof. Skene; in *Pepper's System of Practical Medicine* is a short and well-written notice of it by Dr.

Jenks (vol. i. p. 380); and scattered through French and German journals will be found many brief references of similar character. Vaginal cicatrices are usually caused by slight ruptures of the vagina during labor or the sloughing that follows parturition, by traumata of the walls that heal by granulation, and by the injudicious use of caustics. Much of this is preventible. Thus, when a caustic—such as nitric acid or the solid nitrate of silver—is employed, the utmost care in limiting its area and in preventing its deep action below the epithelial layer of the mucous membrane should be exercised. If rents or lacerations in the vaginal surface after parturition can be detected, they should, when practicable, be closed by catgut suture.

When surgical or accidental traumata heal by granulation instead of by first intention, the granulations should be so treated as to prevent their degenerating into cicatricial tissue.

But when all this is done many cases will remain in which cicatrices will occur in spite of our best efforts at prevention.

When once formed, vaginal cicatrices are tense, inelastic bands, often prominent above the surface, with deep sulci between them, frequently tender from compression of the nerve-filaments they contain, paler in color than the adjacent mucous membrane, and prolific sources of reflex irritation to all the pelvic organs. They may be so broad as nearly to occlude the vaginal canal, as in some of the traumatic atresias previously noted, or so narrow as to constitute sharp projecting filaments only; so near the vulva as to prevent coition, or extending like radii of a circle from the cervix uteri to the edges of the vaginal cul-de-sac, and here constituting an insuperable barrier to the use of pessaries and maintaining uterine displacements; when distended or pressed with the finger they are often intensely hyperæsthetic, commonly only tender. In a small percentage of cases they are the direct and only causes of vaginismus, and sometimes induce reflex irritation of the bladder or rectum.

The tenderness, Skene thinks, is most marked in scars "at or near the introitus vaginæ;" but I have seen intense discomfort, both local and reflex, caused by cicatricial bands in the posterior fornix.

Their TREATMENT, to be effective, must be by either discission or excision. I have never seen any benefit accrue from pressure or dilatation. When the cicatrix is tense and superficial, especially if it be movable on the subjacent tissue, it should be completely excised with scissors and the healthy mucous membrane united over its site with catgut or silver sutures. If immovable, thicker, or more deeply seated in the vaginal wall, it should be nicked or divided by knife or scissors at a number of points, and at one or more a portion of it removed if possible. After this, in each case, the vagina must be kept as fully distended as possible by a Sims glass plug or dilator. This is essential,

or recontraction will probably occur in the process of healing. When the dilator is introduced and removed a warm antiseptic douche should be employed. The dilator must be worn for several hours each day until union is complete, and occasionally thereafter for two or three months. Dr. Skene recommends in its stead, what I have never employed—viz. slippery-elm bark made into a roll of proper length and thickness and beaten until it is soft. This, dipped in carbolized warm water, is introduced as a tampon, when its very slow expansion causes gradual and painless distension of the cicatrix and the whole vagina. This plan merits a trial when the plug cannot easily be borne.

Septate Vagina or Double Vagina.

This deformity occurs when the vagina is divided by a longitudinal septum, and is another result of arrest of development. Its immediate cause is the non-absorption of the intervening walls between the ducts of Müller, while their lower ends have coalesced to form the introitus vaginæ. It is commonly said to be associated with a double uterus, but this is by no means always the case. The septum consists of tissue exactly like that of the vaginal walls, and is usually about one-eighth of an inch thick; it extends either from the vulva to the os uteri or from any variable part of that distance.

Generally, the two canals are found side by side, but not precisely parallel with each other; much more rarely they are situated anteriorly and posteriorly, being divided by a transverse septum.[1]

In a few exceptional cases one vagina is imperforate, forming a blind pouch which may fill with blood from the uterus, with which it communicates, or undergo suppurative inflammation and form an abscess.[2]

Except in the last-named condition duplicity of the vagina causes little or no inconvenience. It is commonly discovered by accident, often during parturition: usually only one vagina is used in coition. Where dyspareunia or other difficulty from the intervening septum causes the patient to seek medical advice, division or entire removal of the septum is the only treatment that will afford relief. This can be done with bistoury or scissors, but much better (as it is often very vascular) by the thermo-cautery knife raised to a bright-red heat. The patient is anæsthetized and placed in the left semi-prone position; both vaginæ are retracted by Dawson's modification of Sims' speculum with split blade. The septum, now rendered tense, can easily be divided by the cautery knife, an ivory paper-cutter being used if desired for counter-pressure in the opposite canal. Antiseptic dressings follow.

[1] Dempsey's case in *Dublin Journ. Med. Sci.*, vol. lxvi.

[2] Kleinwächter: *Zeitsch. für Geb. u Gyn.*, xi. 254.

Vaginismus.

By vaginismus is meant a condition of reflex spasm or painful involuntary contraction of the sphincter vaginæ muscles. We owe the name and most of our clinical knowledge of it to Dr. Marion Sims;[1] its etiology has been studied and described by Hildebrandt,[2] Matthews Duncan,[3] Henrichsen,[4] Emmet, and Thomas. An excellent summary of the subject will be found in Hart and Barbour's *Manual of Gynecology*.[5] The researches of these authors show that vaginismus may be caused by urethral caruncles, by fissures around the vaginal orifice or within the anus, inflammation of the hymen or of its remains after rupture, minute ulcerated spots at the fourchette or in the fossa navicularis, and, finally, in some exceptionally hyperæsthetic women, without any perceptible local cause. Sometimes, but very rarely, it is reflex, as from cellulitis, ovaritis, or prolapse of a tender ovary. The conditions leading to its development, except in the case of anal fissure, may exist for years before giving evidence of its existence, but a vaginal examination or attempts at coition at once make it manifest. Hence its main symptoms are dyspareunia and sterility.

A vaginal examination causes immediate and persistent spasm of the muscles, with intense pain. The expression of the face is often careworn and distressed.

The prognosis of vaginismus is favorable; indeed, when we consider the intense discomfort and unhappiness it induces and the simplicity of its treatment, it is peculiarly so.

Treatment. — Dr. Sims advises a superficial or deep incision through the sphincter vaginæ muscles in this manner: The patient is anæsthetized and placed in the lithotomy position; the vaginal orifice is stretched moderately by two fingers introduced into the vagina; a bilateral incision is then made with a bistoury through the mucous membrane into the bulbo-cavernosus muscle on either side, extending "for 1½ or 2 inches from a point half an inch above the ostium vaginæ to the raphé of the perineum." To be efficient, this should pass deeply into the substance of the muscle, and often causes pretty copious hemorrhage. The stretching is now repeated so as thoroughly to paralyze the muscles for a time. The vagina is tamponed with lint—and this must be done very thoroughly or hemorrhage will recur—a firm compress and T-bandage are applied to prevent disturbance of the tampon, and subsequent pain allayed by small quantities of morphia. In twenty-four or forty-eight hours the tampon is removed and a glass dilator substituted. In a week the patient is out of bed, the dilator meantime having been removed daily and warm antiseptic injections

[1] *Amer. Med. Times*, 1862.
[2] *Archiv für Gyn.*, iii. 221.
[3] *Dis. of Women*, 1883, p. 142.
[4] *Archiv f. Gyn.*, xxiii. 59.
[5] Ed. 1886, p. 501.

used; for one or two months longer the dilator must be worn at night and sexual intercourse interdicted. Various modifications of this plan have been practised with success during the twenty years which have elapsed since Dr. Sims proposed it.

Thus it has been advised to overstretch the muscles at the ostium vaginæ only without subsequent incision. This, of course, is based upon Récamier's operation for anal fissure, and may be done either by passing two fingers of each hand (as does Hegar) or the thumbs (as advised by Tilt) into the vagina, and then forcibly separating them until some fibres of the sphincter muscle are felt to give way. This operation is bloodless, but can never be accounted so efficient as that of Dr. Sims, and should be reserved for slight cases.

If there be fissures of the anus or within the vaginal outlet, their base should be incised with scalpel or lightly touched with the thermo-cautery. If the morbid irritability should seem to be confined to the hymen, this should be carefully dissected out; an irritable urethral caruncle or inflamed carunculæ myrtiformes must also be completely removed and their base carefully cauterized. Irritable ulcers are to be similarly cauterized, and subsequently dressed with iodoform or iodoform ointment. But in each of these cases the cure will be incomplete without the subsequent use of the dilator, and often this cannot be borne until forcible dilatation is practised. It may therefore be said that forcible dilatation, with or without Sims' incision, is practically essential for the cure of all cases of true vaginismus. In the after-treatment constitutional measures must never be neglected in delicate subjects. Fresh air, out-of-door exercise, tonics when indicated, and especially change of scene with temporary absence from home, which is most likely to secure complete sexual rest, should be enforced upon the patient; and a cure may confidently be predicted.[1]

Displacements of the Vaginal Walls

consist mainly of cystocele, rectocele, and complete or incomplete prolapse of the vagina, which is always accompanied by prolapse of the uterus. Although commonly due to the subinvolution that follows parturition, this is not invariably the case. Prochownik[2] reports the case of a virgin, aged twenty, in whom a combination of very hard work with imperfect nutrition caused a complete prolapse of the posterior wall; but here a congenital deficiency of the perineum contributed to the lesion. Billroth[3] records another of similar kind with prolapsus uteri and vesical ectopia.

And, through the kindness of Dr. Boldt of New York, I have

[1] See Vol. I. p. 511.

[2] *Deutch. med. Woch.*, 1884, No. 36.

[3] *Chirurg. Klinik.*, Berlin, 1879.

lately witnessed another of the same kind, with both cystocele and rectocele, for which Hegar's operation was done by Dr. A. Martin of Berlin. But these are rare and simply curious exceptions: the rule remains that in the vast majority of cases the cause of vaginal displacements is subinvolution of the vaginal walls after the distension that occurs in parturition.

In the first volume of this work (p. 667 *et seq.*) Prof. Reamy has so fully described the etiology and pathogeny of this condition that a repetition here is useless. But a brief statement of the means of curing these distressing malconditions will not be out of place. In surgery alone can these be found, for no pessary or combination of pessaries that has ever been devised will sustain the prolapsed vaginal walls when the uterus also is prolapsed. In deciding the means to be adopted the exact nature of the existing lesion must be carefully ascertained. To effect this the patient should be examined both in the standing and supine position; the semi-prone position of Sims is useless. The patient when supine, with the knees flexed at right angles or drawn up in the lithotomy position, should be made to hold her breath and strain or "bear down" as forcibly as possible. In a moment the vaginal walls will roll out of the introitus to the full extent permitted by the loosening or redundancy of these tissues, and the cervix uteri will descend and perhaps become procident. By the reverse action of the muscles the vaginal walls can be partially drawn in, but not completely. We can now judge whether the anterior or the posterior wall be the more redundant and most in need of repair: when cystocele exists some laceration of the perineum will almost always be found, but the most complete rectocele is sometimes seen without a corresponding cystocele. If pressure by the finger be made upon either of the tumorous masses thus formed, it will be found soft, elastic, yielding, and by steady pressure easily returnable to the vagina. Should any doubt be felt as to its nature, a rectal examination with the finger or an exploration of the bladder with a well-curved sound will at once remove uncertainty. This, indeed, should never be omitted, for it affords us the only clear evidence obtainable of the thickness of the vesico-vaginal or recto-vaginal septum, which is most important when we come to operate.

Besides the symptoms of vaginal prolapse that characterize this condition, the patient often suffers from all the inconvenience of partial retention of urine, which gravitates into the pouch forming the cystocele, and from difficulty in defecation due to impairment of expulsive power in the rectal wall. The operations devised for its relief are grouped under the name of elytrorraphy or colporraphy, and subdivided into anterior and posterior colporraphy as the procedure is applied to the anterior or posterior wall of the vagina.

An excellent résumé of the improvements that led to the operation of colporraphy, as now employed, is given by Thomas,[1] Emmet,[2] and Parvin,[3] whose remarks may be consulted with advantage by the student.

ANTERIOR COLPORRAPHY.—Among many variations of this operation—of which the aim is so to narrow the anterior wall of the vagina as to give firm support to the bladder and uterus—three have commended themselves to the profession in this country and Europe, and will here be described.

These are Sims' as modified by Emmet, Hegar's, and Le Fort's. The priority of performing the latter is claimed by Neugebauer of Cracow, but in this country it is universally known as Le Fort's. Besides these a simple and ingenious method of operation has been devised by Stoltz of Nancy, for which the reader may consult Dr. Mundé's *Minor Surgical Gynecology*,[4] where it is well described.

I. Sims' and Emmet's operation, which was matured twenty years ago, consists in denuding an irregular triangle of mucous membrane upon the anterior vaginal wall, which is mapped out in this way: The patient, anæsthetized, is first placed on the back. The uterus is thoroughly anteverted, and the cervix so held with a probang sponge while she is turned in the left semi-prone position. Sims' speculum is then introduced, and the mucous membrane is caught up by tenacula a half inch on either side of the cervix and a little behind it. If these can be approximated, the mucous membrane is snipped out to mark the upper angles of the triangle; these freshened surfaces should be at least half an inch square. Then a similar space of twice the size, just in front of the cervix, is to be denuded in like manner. A needle carrying silver wire is now passed under these denuded spaces in such a way as to approximate them exactly by tightening and twisting the

FIG. 9.

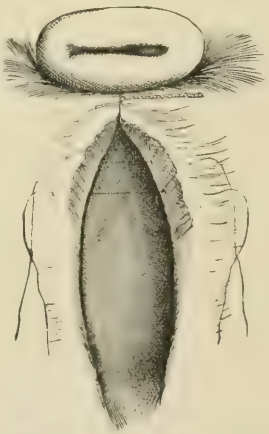


FIG. 8.

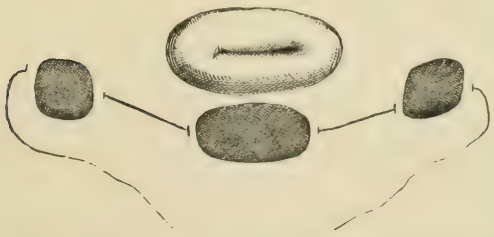


FIG. 8.—Emmet's Operation for Procidentia, as would be seen with the woman on the knees and chest (Emmet).

FIG. 9.—Folds formed after Twisting the First Suture (Emmet).

[1] *Diseases of Women*, 1884, p. 176.
[2] *Op. cit.*, p. 356.
[3] *Internat. Encyc. Surgery*, vi. 740.
[4] Ed. 1885, p. 522.

wire. This puckers the anterior wall into a deep sulcus, the mucous membrane of which is denuded with scissors, until the vestibule is reached, in the form of an ellipse. When this space is carefully cleaned of any tags or remnants of mucous membrane which may have escaped the scissors, and washed antiseptically, the wound is closed with interrupted sutures of silver wire, the needle passing as deeply under the surface as the thickness of the septum will permit, and four or five sutures to the inch being inserted. These are successively twisted from above downward, cut short, and made to lie flat on the vaginal wall; and after again cleansing the vagina the parts are supported with an antiseptic pad or tampon. The patient is kept in bed, on side or back at option, for two weeks, during the first of which the bladder is emptied by the catheter. Then the sutures are removed, but unless cicatrization is firm the patient should still remain recumbent another ten days or fortnight, and must be cautioned against any effort at straining or lifting heavy weights for several weeks more.

The results thus obtained are generally, but not always, satisfactory.

II. Hegar's operation, as modified by Werth of Kiel and the late Prof. Schroeder of Berlin, aims at the same result in a different manner. The patient, anæsthetized, is placed on the back, with the thighs well retracted in the lithotomy position. I employ Clover's lithotomy crutch to sustain the thighs, and a submucous injection of cocaine solution (4 per cent.) if the patient objects to ether. With a tenaculum the mucous membrane of the vestibule just behind the urethra is caught up and kept on the stretch, and the extreme lateral margins of the anterior wall are similarly held with tenacula or locked forceps. Then with a bistoury or scalpel a triangular incision is made through the whole thickness of the mucous membrane, with a broad or rounded apex in the vestibule and the base a half inch in front of the cervix uteri, and the flap thus formed is carefully dissected off from the base upward. If the vesico-vaginal septum be thin, extreme care is needed in this dissection to avoid opening the bladder, an accident that has more than once happened. The fingers and the handle of the scalpel will accomplish much in this process, but the central line (consisting of the anterior column of the vagina) is so tenacious and muscular that either knife-blade or scissors is here a necessity.

When the flap is removed, the raw surface is carefully trimmed with scissors of any tags or strips of mucous membrane that may remain, and with a curved needle (not Hagedorn's, which here is apt to cut the tissues) a long suture of stout catgut is passed under the denuded apex and its end tied firmly. Then the edges of the wound are firmly approximated by the overlapping cobbler's stitch from above downward, an assistant keeping the catgut taut after each time the needle emerges. When the base of the triangle is reached, repeated stitches

must be taken through the whole thickness of the mucous membrane or the catgut may stretch or yield. If much tension is apprehended, a preliminary line of suture may be run deeply down through the centre of the wound, including a less amount of tissue, and the sides then approximated as before.

The distinctive features of Hegar's operation are the mode of removing the flap, the cobbler's stitch, and the animal suture, which is not touched or looked for until after cicatrization is supposed to be complete. Its advantage is the comparative rapidity with which the operation may be thoroughly performed, and in my hands it has yielded excellent results. The after-treatment is the same as for the Sims-Emmet operation.

III. Of the procedure devised by Leon le Fort, which was chiefly intended for general vaginal prolapse, the following description is condensed from Le Blond[1] and Sinéty:[2] The patient is placed on the back, with thighs flexed as by Hegar, and the uterus is drawn down and out of the vulva to its full extent. While so held by an assistant four incisions are made on the anterior vaginal wall as near as possible to the vulva, and a raw surface obtained six centimeters long by two wide; then, drawing the uterus upward and forward, a similar space is denuded upon the posterior wall of the vagina. Pushing back the uterus sufficiently to bring the upper edges of the two raw surfaces in contact, lateral sutures of silk or silver wire are now passed in such a manner as firmly to unite the anterior and posterior walls for the distance indicated. If silk or thread be employed, it is essential to cut the ends long, so as to avoid their being lost in the sulcus which results from the operation: well-annealed silver wire is equally manageable and preferable in every way. Thus, the uterus is, as it were, pocketed above a firm pad obtained by agglutinating the vaginal walls, and an artificial atresia vaginæ results. For obvious reasons this method is only applicable in advanced life or at least after menstruation has ceased.

It has been used extensively in France, and good results are reported from it. In this country it is comparatively rare.

Posterior Colporrhaphy and Perineorrhaphy.—As the posterior vaginal wall and perineum form the main support of the uterus, and as they are the tissues always most sure to suffer when the soft parts are damaged during parturition, it is natural that their laceration or other injury should always have excited the chief interest of both patient and surgeon. Accordingly, we find from the earliest times a much greater multiplicity of suggestions for their repair than have ever been made for cystocele. It is known that Ambroise Paré operated with success, but after his day failure was so frequent that the opera-

[1] *Traité élément. de Chir.-Gyn.*, p. 407 *et seq.*

[2] *Man. prat. de Gyn.*

tion was gradually abandoned until, fifty-five years ago, Roux again revived it successfully with the quill suture. After him, Baker Brown in London and Dieffenbach in Berlin did much to attract the attention of the profession to the subject, obtaining a fair success with the quill suture, as did Roux. Since then Sims and Emmet in this country, Langenbeck, Simon, Hegar, Schroeder, and Martin in Germany, and many minor authorities in France and England, have labored to improve our methods of procedure, until it can now be said that secondary posterior colporraphy and perineorraphy have reached a stage closely bordering on perfection.

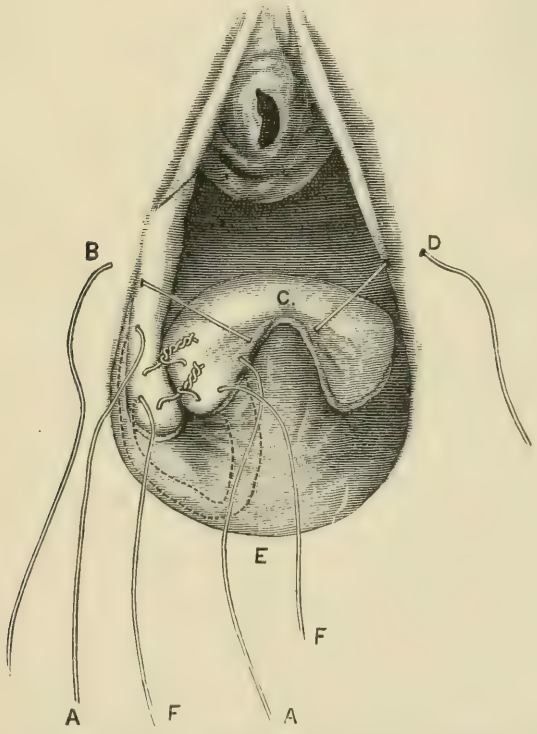
As a history of the various steps by which this has been attained is beyond the scope of a practical article like the present, only two methods of operating will be described—Emmet's and the Simon-Hegar operation, which I believe to be the most perfect in themselves and to give the best results.

Emmet's method of performing posterior colporraphy is as follows: The patient, anæsthetized and supine, is drawn down to the edge of a narrow operating-table; the thighs are flexed upon the abdomen and retained by the application of "Clover's crutch." Flannel drawers and stockings should be worn. Two assistants are desirable besides the anæsthetizer, although the operation may be done with only one. For most of the sutures silver wire, well-carbolized silk, or carefully-prepared catgut of medium size may be used with equal success; but what is called the "crown suture" should never be of catgut, as the tension upon it will be too great.

For the detail of the operation I will quote Dr. Emmet's words: "The first step is to seize with a tenaculum the crest of the presenting rectocele or the posterior wall of the vagina at a point where it can be drawn forward without undue traction to near the entrance of the urethra, and the instrument is then to be placed in the hand of an assistant, which is to rest above on the pubes. Then the operator is to hook up with a tenaculum the lowest caruncle or vestige of the hymen" (on either side), "and then bring the three tenacula together. When this has been done, it can be seen at a glance what tissues are to be united together, as a crescentic ridge will be found just within the vagina, running across its axis, with each horn becoming gradually lost in the sulcus on each side. The vaginal canal will be found reduced in size, the perineum will have been apparently drawn up toward the arch of the pubes, and the tissues at the previously gaping outlet will have been rolled in until the vaginal entrance is no larger than that on any female who has not given birth to a child at full term. To be able to freshen the surfaces, the surgeon now hands a tenaculum, with which a caruncle has been caught up, to the assistant on the side where he wishes to begin, while the tenaculum in the centre of the posterior

vaginal wall is to be still held above in the median line. If slight traction be made with the outer tenaculum, two triangular-shaped folds at once are formed by the apex of each being drawn out with a tenaculum, the upper angle running into the vaginal sulcus on that side, and the other toward the skin which would form the outer portion of the fourchette if it were intact. These two surfaces are the ones to be denuded and united. The first suture is to be introduced in the angle at the sulcus and from thence forward. Fig. 10 represents both sides

FIG. 10.

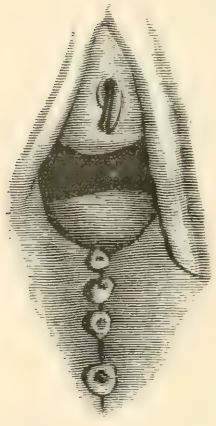


Emmet's Inside Operation for Diminishing the Size of the Vaginal Outlet.

of the vagina denuded, and all the sutures on the right side have been introduced. Two of these near the angle have already been twisted, while two others (F and A) have not yet been secured, and the dotted lines indicate the direction in which they were introduced. The suture B C D is an important one, as it closes the whole line, but in the operation it is never introduced until the last, after all the others have been gathered on both sides, and it is also the last one to be twisted. Its course from the labium on one side over to the crest of the rectocele, or posterior wall of the vagina, and to the opposite labium, is such that, when it is tightened, the parts are all brought up together. It is employed,

as we shall see hereafter, for this purpose in all operations for closing a lacerated perineum where the support is to be gained from the posterior wall of the vagina. After all the vaginal sutures have been twisted a shallow line in the direction C E will remain open. This has been formed by bringing together the surfaces between B E on one side and D E on the other. These edges should be united by sutures passed deep enough to include in the centre ones a portion of the posterior wall of the vagina. They can be secured by perforated shot, as shown in Fig. 11, with the ends of the wires cut off; and when the labia are allowed to close together the sutures will be generally hidden from view.

FIG. 11.



Appearance at Completion of Operation (Emmet).

"It is maintained, as has been stated, that this limited line through the soft parts, all anterior to the seat of the hymeneal ring which marked the line of junction of the vaginal canal and the external organs of generation, is all of the perineum ever involved, unless the tear should extend through the sphincter ani.

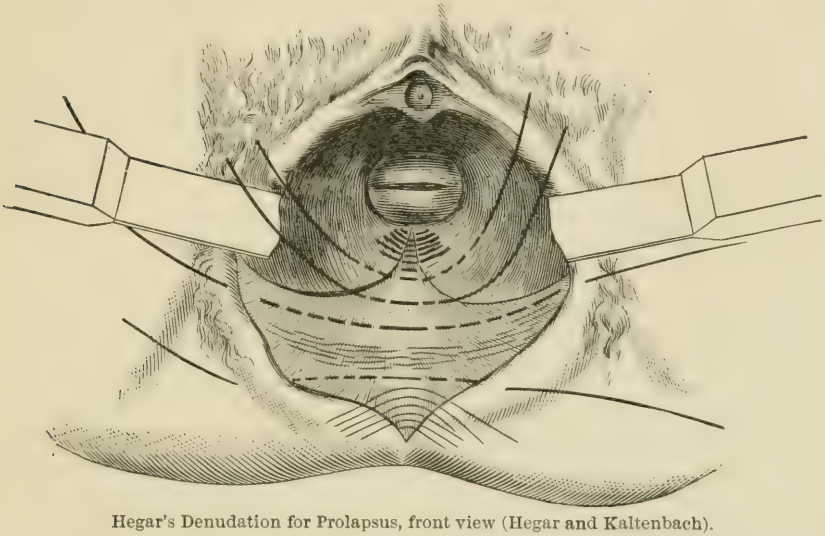
"There are two points in the operation which require some exercise of judgment, and success will be the greater with increased experience. The most common mistake would be committed by taking up too much of the posterior wall; and if this be done, failure may result from the sutures cutting out. It is equally important to be able to judge of the number of sutures which should be placed in the angle of the crescent. The rule should be to introduce just so many as are necessary to bring the outer angle of the fold formed by the denuded sutures to the vaginal level; and the crescentic line should always be made as small as possible to accomplish this. When I first began to perform the operation I had several instances where the patients suffered a great deal of discomfort afterward from the too great traction exerted. This difficulty was due to having denuded too wide a surface in the angles, so that a prominent fold could be felt in the vagina running off from each angle to the sides, which became the more tense as the line healed and retracted." Silver wire, waxed and carbolized silk, and well-prepared catgut may all be used as sutures, as previously stated.

The after-treatment is simple: rest in bed for two weeks, with hot vaginal injections, very gently given if there be much heat and tension in the vagina. The catheter is unnecessary.

II. *Hegar's Operation.*—This operation, devised by Hegar of Freiburg, somewhat altered by Werth of Kiel, Bischoff, Schroeder, and A. Martin of Berlin, and which is itself a modification of Simon's, is gen-

erally practised in Germany and to some extent in this country, and, like Emmet's, yields very good results. It aims at taking in more of the perineum than Emmet's, and can be understood better from the accompanying wood-cut than from any verbal description. The patient

FIG. 12.



Hegar's Denudation for Prolapsus, front view (Hegar and Kaltenbach).

is anæsthetized, and kept in the supine position with the thighs flexed for lithotomy. Here, as before, the "Clover's crutch" is a great additional convenience. The labia are retracted by two assistants, one of whom also draws upward a tenaculum inserted by the operator in the posterior wall at the apex of the space to be denuded. This must constantly be kept taut to steady the flexible mucous membrane, or the outlines of the intended space will be lost. The tenaculum is so apt to slip out that I prefer to pass through the point selected a needle carrying a loop of thread, through which the needle is then slipped, so as to knot it: steady traction is then easily made with the loop. An incision is now made with a small scalpel along the lines indicated in the diagram, and the entire thickness of the mucous membrane is dissected off within these limits as carefully and expeditiously as possible. This may be done with either scissors or scalpel: in Germany the knife is preferred. When this has been carefully trimmed and finished, two lines of sutures are inserted with as much accuracy as practicable—a short superficial row at the apex and base, and a deep row in the more central part of the space to be closed in. For the superficial sutures catgut answers as well: carbolized silk or silver wire is much safer for the deep sutures. This operation may be more rapidly done than Emmet's, and in my hands it has yielded very good results as long as

I have been able to follow my cases. As most of these have been done in hospital, the number remaining under my observation has been limited; in several of these the uterus has remained firmly supported for three or four years. Hegar reports a very large number of cases that remained well from four to ten years after operation, and in several of these a subsequent pregnancy and parturition had not caused a return of the disease.

Rupture of the Vagina, and Hæmatoma.

The consideration of rupture of the vagina belongs rather to obstetrical than to gynecological literature; but, as it sometimes occurs from traumatic causes, a brief reference to it will here be made.

Besides the occasional ruptures met with in parturition, which occur either at the vault of the vagina in association with laceration of the cervix or at the outlet with rupture of the perineum, it may fall within the province of any practitioner to treat lacerated wounds entailing a complete rupture of the canal. Many such cases have been recorded, as by Fleury,[1] Rey, Colombat,[2] Grenser,[3] and Fehling.[4] The latter narrates the case of an elderly multipara, with long-standing prolapse of the vagina and uterus, quoted by Breisky: "One day, after going up to the fourth floor of her house with a pail of water, the prolapsed uterus became very greatly protruded, and she attempted to replace it forcibly with her hands. As the result a fatal rupture of the posterior vaginal walls occurred, with prolapse of the intestines."

In certain surgical operations or such operative procedures as the forcible reposition of an inverted uterus more or less complete rupture of the vagina may now and then occur. It is especially liable to happen in operations for stenosis, where the distended sac above the constriction has become very thin, and in the forcible extraction of uterine fibroids. The causation in the latter case is, of course, exactly similar to what occurs in parturition.

Apart from the suffering entailed, the dangers of such an injury are due to hemorrhage and sepsis: in parturient cases the latter is very grave indeed, but in traumatic lesions it should always be borne in mind.[5]

The PROGNOSIS will depend upon the rupture being partial (superficial) or complete, or "penetrating" as German authors term it. In the latter it is always serious.

The TREATMENT consists in arresting hemorrhage and repairing the rupture by sutures after carefully cleansing the parts. This can best

[1] *Ann. de Gynécol.*, viii. 457.
[2] *Trait. des Mal. des Femmes*, ii. 424.
[3] *Gräfe u. Walther's Journ.*, vol. v. part 3.
[4] *Arch. für Gyn.*, vi. 103.
[5] See Vol. I. p. 479.

be done by gentle irrigation, and unless the rupture be in the posterior wall a Sims speculum should be used, as giving much more working room.

As the sutures are by far the best hæmostatic, ligatures will rarely be needed; if used, they should be of catgut. Silver sutures are best, but any carbolized or aseptic sutures the surgeon prefers may be employed. A subsequent tampon is unnecessary. Aseptic irrigation will always be found useful and hasten recovery.

HÆMATOMA OF THE VAGINA is an exceedingly rare affection. In the Vienna clinic Wucher reports that in 6000 confinements Späth found only 4 cases; Winckel of Munich estimates that it occurs once in every 1600 cases; in Breisky's clinic at Prague only 1 case has occurred in 2126 births, while Bidder and Sutugin found only 1 case in 3285 confinements (Breisky). In this country and in England no tabular statements within my knowledge have been made of it, but there is no reason to think it more frequent. Most of the few records of it that exist make no distinction whatever from thrombus of the vulva, and the name "pudendal hæmatocele" has been employed to cover both conditions. This, however, is not unnatural, for the two lesions, although distinct in location, do not differ in their mode of origin. The predisposing causes are the greatly increased vascularity, hyperplasia, and relaxation of vaginal tissue that accompany pregnancy, for to this period and that of parturition the accident is practically limited. A varicose state of the blood-vessels may exist, but is not essential to its production. The exciting cause is sudden and forcible exertion which puts an undue strain on the vaginal walls. Thus, a violent fit of coughing has been known to cause it, and any act that entails sudden and violent abdominal pressure may lead to its production. In childbirth, however, traumata, either instrumental or accidental, commonly induce it. It is most frequent in primiparæ, and especially in such as present unusual relaxation of the muscles and fasciæ; thus, it occurs most often perhaps among the upper classes. Its etiology and mode of production are uncertain, as very few and indefinite investigations have been made upon this point; but it is probable that the blood effused is entirely venous, as the more elastic arteries escape pressure or a contusing force with much greater ease than the veins. The swelling also yields no systolic impulse nor any of the characteristics of an arterial growth or tumor. It is rarely or never visible like vulvar hæmatoma, and is recognizable only by the subjective symptoms and the touch. During childbirth, in spite of the fact that the contusing force of the fœtus (or the presenting part of the fœtus) is the direct cause of the hæmatoma, the latter rarely appears until the delivery is completely over. Why it should not occur before the pressure of the advancing child is removed is obvious, but not so its delay until after

the third stage is terminated. In the two (and only two) cases that have occurred in my practice this was the case, and other observers concur in this statement.

The SYMPTOMS will of course vary with the location and extent of the effusion. They are so well expressed by Breisky that I quote his description: "As a rule, there is sudden hypogastric pain, a feeling of bearing down, and, when the tumor is large and affects the posterior walls, painful attempts at defecation. Symptoms of acute anæmia, fainting, and collapse have been observed a number of times, especially when the hæmatoma formed while external hemorrhage was in progress. If, in addition to these symptoms, there be those of tension and separation of the walls of the retro-vaginal septum, with elevation and anteflexion of the uterus and dragging upon the walls of the rectum, the trouble may become very great, and the pain far exceed that which attended the precedent delivery." Although this may seem an extreme statement, it exactly tallies with what occurred in my second case. In June, 1886, a delicate primipara was placed in my care by a medical friend who had lately had several cases of puerperal fever in his practice. Family reasons and her own frail health caused great anxiety to be felt for her approaching confinement. When this took place she was sedulously watched, but each stage of it was quite normal. Slight delay occurred in the second stage; but, although forceps were at hand, they were not at once applied, and before they were deemed necessary the child was expelled with no more than ordinary difficulty. A trifling rent in the cervix and slight laceration of the perineum occurred; the child was a finely-developed boy and had presented by the vertex. The third stage was entirely natural, the placenta coming away entire by Credé's method. Although the perineal tear was unimportant, I thought it wiser to repair it, in view of the general muscular relaxation of the patient; and, administering a little more chloroform, I brought the edges carefully together with two sutures of Chinese silk. Not until this second anæsthesia passed off did the symptoms of the ensuing hæmatoma appear. Then, with the complaint that "something else seemed to be coming down," the patient evinced signs of great distress, which rapidly increased until her suffering became insupportable. Thinking her hysterical, I tried in vain to pacify her, and soon had to give a large hypodermic injection of morphia; this also proving fruitless, I reluctantly cut out the perineal sutures, fancying the tension to be more than she could tolerate. This was equally ineffectual, and, in addition to her obvious suffering and declarations that the pain was worse than the previous labor-pains, the patient's increasing pallor and thready pulse seriously alarmed me. Once or twice she gasped for breath and seemed likely to sink into a state of collapse, but whether from hysterical excitement or some internal loss of blood I could not

possibly discover. The anxiety of the situation may be imagined, for to one who tries to work both faithfully and intelligently I suppose the most harassing of all feelings is that of ignorance of the cause of existing danger.

Up to this time the uterus had been, and continued, firmly contracted above the pubes, there had been little or no external hemorrhage, and a most careful exploration at the beginning of the pain had shown nothing perceptibly wrong with either uterus or vagina. Much puzzled, I now made a fresh examination, when, to my surprise, the whole posterior vaginal wall bulged forward so as almost to obliterate the canal; the cervix uteri was pushed upward and forward behind the arch of the pubes; and the cause of both suffering and collapse was obvious. No swelling or discoloration of the vulva existed; but, although arrested by the deep perineal fascia, enough blood had been effused into the recto-vaginal septum within the short time that had elapsed since my last examination to cause the suffering described and to jeopardize a dangerous collapse. When discovered the damage had been done, nor could it by any means known to me have been anticipated or averted. Happily, no more hemorrhage occurred, and the patient made a slow but complete recovery. Within forty-eight hours the vulva and much of the nates became discolored by the effused blood; this doubtless relieved the tension above, which at first was so great that, fearing a rupture of the distended vaginal wall and recurrent hemorrhage, I kept the patient under an assistant's constant supervision for several days and nights.

The DIAGNOSIS of vaginal hæmatoma should not be difficult. In addition to the foregoing symptoms, although nothing is visible externally, a digital examination readily detects the swelling. This is usually globular, smooth, compressible, not very tender, and if exposed with the speculum its bluish or purple color is highly significant of imprisoned blood. It may be either imperfectly pediculated or sessile; occasionally the thinned vaginal wall has given way and the oozing venous blood that escapes is characteristic. These appearances and the history of its sudden onset suffice to complete the diagnosis.

The PROGNOSIS is commonly favorable.

In its TREATMENT the main point will, of course, be to decide whether or not to open the tumor. As a general rule, it may be said this should not be done, for no means of compression that we can apply high in the vagina, whether by tampon or colpeurynter, will surely suffice to prevent a recurrence of the hemorrhage.

Two conditions—and only two, that I know of—form the exception to this rule: viz. when suppuration in the cyst has occurred or threatens, and when the hæmatoma occurs in late pregnancy and forms a barrier to delivery. In the first of these septicæmia may result

from inaction; in the second the necessity is obvious. If this be done or if the sac have spontaneously ruptured, we should gently evacuate its contents and cleanse it thoroughly with warm antiseptic injections, and then pack it with iodoform gauze. After this a firm tampon with a T-bandage must be carefully applied. In ordinary cases antiseptic and astringent injections should be used daily, the vagina tamponed in the intervals, and the patient kept in the recumbent position.

Foreign Bodies in the Vagina.

Although this subject is treated in all works on general surgery, a brief allusion to it should be made here.

Foreign bodies of the most various and unexpected character have been removed from the vagina, where their detection was only caused by the inflammation they had begun to excite. As a rule, the patient denies all knowledge of their presence, and is apparently more surprised than the surgeon by their discovery. Thus, Mr. Hilton removed a flat bone netting-mesh ten inches long from the vagina of a young girl; it had to be divided before removal.[1] Mr. Birkitt[2] removed with forceps an ale-glass $2\frac{1}{2}$ by 3 inches in size, and in another case a glass bottle. Many other cases are recorded where a hair-pin (Getchell),[3] spools (Breisky, Hoffman, Carter), broken glass from specula or syringes (Kurz, Day, Levis), pomade-pots (Schroeder, Dupuytren), sponges (Capuron, Meissner, Runnals), and long-forgotten or neglected pessaries, have been removed by surgical aid. In some of these instances extensive and long-standing inflammation, ulcerations, or abscess had been induced by the foreign body, and in more than one this led to a fatal result. Ascarides sometimes pass from the rectum into the vagina, especially in children, and excite the most troublesome vaginitis.

Of the detection of foreign bodies in the vagina nothing special need be said. This only becomes difficult when they have become so imbedded in the tissues or covered with granulations as to be difficult of recognition. Thus in one of the cases narrated by Breisky[4] a spool, introduced many years before, had ulcerated through the fornix vaginæ and lay in a pus-cavity between the uterus and rectum. Only a rectal examination demonstrated its presence.

In their TREATMENT the general rules of surgery are to be followed, and, as far as possible, with antiseptic precautions.

Where the foreign body has become encrusted with granulations, or, as in the case of old pessaries, has sunk deeply into the vaginal wall,

[1] *Med.-Chirurg. Trans.*, xxxi. 315.
[2] *London Lancet*, 1856, ii. 451.
[3] *Philada. Med. Times*, 1873.
[4] Billroth: *Handbuch der Frauenkrankeit.*, and *loc. cit.*, p. 365.

it is to be cut out with extreme care, and all approach to roughness in manipulation must be avoided. If broken glass be detected, it will be wise to follow the ingenious device of Levis, who cautiously filled the vagina with liquid plaster-of-Paris from a syringe, and, after it had securely set, removed the mass, which was now a complete cast of the vagina containing all the fragments of glass in it. If this be contemplated, it is well to give a preliminary injection of olive oil or melted vaseline, and to use the plaster after the vaginal walls are thus lubricated.

In all cases the use of antiseptic injections should follow the removal of the foreign body, and if there be much vaginitis the patient should remain recumbent until it has completely disappeared. If in spite of these precautions the vaginal wall be torn during the extraction, such injury must be treated on general principles.

Neoplasms.

Like the uterus—although much less frequently from the less active vitality of its tissues—the vagina is the seat of new growths, with which some acquaintance is essential to the practitioner.

These are chiefly *fibromata*, *sarcoma*, *carcinoma*, *tuberculosis*, and *cysts*, which, in this order, will be severally described.

Cases of lipoma (Pelletan), partial hyperplasia (Kiwisch, Breisky), and diffuse papillomatous degeneration (Klob, Marsh, Müllerklein) of the vaginal walls have also been reported, but in the present state of our knowledge these are to be regarded as mere curiosities.

I. Fibroma (fibro-myoma, fibroid tumor, myoma) of the Vaginal Walls is quite a rare formation. In 1882, Kleinwächter[1] collected 50 cases then found scattered in medical journals, to which he added 3 more, including 1 that occurred in his own practice; to these Breisky[2] makes 5 additions—2 from A. Martin, and 1 each from Hermann's, Caswell's, and his own experience. These 58 comprise all the reported cases I know of, although doubtless many have been found and treated without appearing in print. In 44 of these cases, where the location of the growth was accurately stated, it was found to spring from the anterior wall in 28, from the posterior in 11, and from the lateral wall in 5 cases. Generally, the fornix or upper third of the vagina was the point affected. No cause of this distribution is assignable. Although most of the reported cases occurred at the period of greatest sexual activity, age seems to exert no special influence upon the development of fibroma, for it has been found in early childhood (Martin, Wilson, Trätzl) and at the age of fifty-one (Greene). Its growth is slow—in Neugebauer's case twenty-two years, and in Greene's

[1] *Zeitschrift für Heilkunde*, 1882. [2] *Loc. cit.*, p. 348.

fourteen, having passed since the patient knew of the existence of the tumor.

Its histological structure may be either that of a pure connective tissue or muscular growth, the latter greatly predominating in frequency; Klebs and Virchow so regularly found smooth unstriped muscular fibre in sessile growths of this kind as to assimilate them with uterine fibro-myomata, of which I have elsewhere[1] described the composition. At least one case has been described (by Sir James Paget) consisting of pure connective tissue.

The growth originates in either the submucous or the muscular layer of the vaginal wall. Virchow believes it grows from without inward, and has never met with the polypoid form of myomata. Undoubtedly, the tendency of vaginal fibroids is to become pediculated and polypoid as they increase in size, and to project first into the vagina and then outside the vulva. This is illustrated by the cases reported by Demarquay, Scanzoni, Dufour, Neugebauer, Porro, and others. In Scanzoni's case the pedicle was thin; generally it is thick and vascular. The size of the tumor may vary from that of a bean or lentil to that of a child's head at full term; in Gremler's much-quoted case[2] it weighed more than ten pounds: in one observed by Baudier it was equally large; a number of others have been over two pounds.

The SYMPTOMS of vaginal fibroma may be absolutely negative; and when the growth is very small this is so, and its discovery is made by accident. When larger, it occasions dragging pelvic pain, rectal and vesical pressure, leucorrhœa, dysuria, and even retention of urine, dyspareunia. If complicated by pregnancy, it may effectually arrest the progress of labor, as in cases reported by Gentrul, Pelletan and Van Doeveren, McClintock (who met with two such), and Gremler. When the tumor has been extruded from the vulva it causes the same discomforts that attend procidentia of the uterus from venous stasis, ulceration, and irritation of the neighboring parts.

The DIAGNOSIS is readily made, for the firm, elastic, and often lobulated surface of the growth indicates its nature. It may be simulated by a cyst with firm, elastic walls, in which case exploratory puncture, as practised by Demarquay and others, will aid us to decide. From sarcoma it is more difficult, if not impossible, to distinguish it, except by microscopic section.

The PROGNOSIS is favorable unless ulceration of the tumor has begun; then the risk of septicæmia is so considerable that a more guarded prognosis must be given.

The TREATMENT consists in extirpation only. This may be accomplished by enucleation, which is most generally applicable, by excision, or by ligature when the growth is pediculated. If the tumor be deeply

[1] Ashhurst's *Internat. Encyc. of Surgery*, vi. 808. [2] *Med. Zeitung*, 1843

imbedded, enucleation is by no means easy, for enough of the wall-covering must be preserved to effect easy union of the remaining wound and prevent the formation of a pocket; to secure this, the surface tissues must be peeled with the finger-nail or the handle of the scalpel. In pedunculated growths the pedicle, if it can be reached, should be perforated with a needle carrying a stout double ligature of silk, which is to be crossed and tied securely on both sides. This best guards against hemorrhage, which is always the risk to be apprehended, and in the case of large fibromata this may be very severe. It occurred to an alarming extent in Neugebauer's case when écrasement and the galvano-cautery were used. In any case, whether the tumor be pediculated or sessile, after its removal is effected carefully-adjusted sutures should be applied to close as accurately as possible the vaginal wound (and these must be very deep when the cavity is deep), and the vaginal wall supported by a tampon of iodoform gauze until union is secured. In removing this tampon every second day antiseptic injections should be used, and the wound then freshly dusted with iodoform.

II. Sarcoma of the Vagina is yet more rare than fibromatous growths, and has only recently attracted the attention of observers. Accurately-noted cases, where the diagnosis was assured by microscopical examinations, have been recorded by Mann,[1] Sänger,[2] Hauser, Bajardi, A. R. Simpson,[3] Simmons,[4] Ahlfeld, Demme, Spiegelberg,[5] Babes, Kaschewarowa, Meadows,[6] Fraenkel, and Soltmann;[7] perhaps by others who have escaped my attention. Of these reports, Sänger's may be consulted for the literature of the subject up to the date of his paper, and Breisky[8] for an analysis of the more interesting cases.

As in the uterus, sarcoma of the vagina appears in two distinct forms—as diffuse degenerative deposit on the surface, or as a round circumscribed tumor in the submucous tissue. The difficulty of distinguishing it from carcinoma on the one hand and from fibromatous growths on the other will thus be seen at a glance. It may occur at all ages, three of the cases reported having been those of children, of whom the eldest (Demme's) was five and a half years old.

The symptoms are negative in the early stages; later, in the round tumorous form, they are the same as those of fibromatous growths, with the addition of much aching pain; in the diffuse variety there is less pain, but a constant leucorrhœal, semi-purulent, or sanious discharge which attracts attention and annoys the patient. In both there is a distinct cachexia, but less marked than in cancer.

These symptoms indicate the diagnosis; but, as already stated, the

[1] *Am. Journal Obstet.*, viii. 541.
[2] *Wiener med. Wochenschr.*, 1880.
[3] *Contrib. to Obstet. and Gyn.*, 204.
[4] *Edinburgh Med. Journal*, 1885.
[5] *Arch. für Gyn.*, iv. 344.
[6] *Trans. London Obstet. Society*, vol. x.
[7] *Schmidt's Jahrbücher*, 1882.
[8] *Loc. cit.*, p. 356.

differentiation of the two specified forms from fibroid and cancerous growths is so difficult that we are compelled to rely upon the microscope alone.

The PROGNOSIS is exceedingly serious, and its gravity should be frankly stated to the patient or her friends at the same time that prompt removal of the growth is urged upon them. In the fibroma-like form it is rather more favorable, at least one case of this (Spiegelberg's) having suffered no relapse for four years, at the end of which time the patient was lost sight of.

The TREATMENT consists in removal of the growth as soon as detected, and as completely as this can be accomplished. In the circumscribed form this is to be done, or attempted, as for myomata—by excision or enucleation. In a number of recorded cases this has been done; as, for example, in Bajardi's, where a pediculated tumor the size of a hen's egg, which proved to be a round-celled sarcoma, was removed by the galvano-cautery; in three months it had returned, and two sessile tumors were now found in the posterior wall near the site of the former pedicle. These also were removed with the galvano-cautery; again relapse occurred, and in eight months more the patient died of peritonitis.[1] When it occurs in the diffuse form, vaginal sarcoma may be palliated by careful curetting, followed by iodoform or other antiseptic dressing. This is the more intractable and rapidly fatal variety.

III. CARCINOMA OR CANCROID OF THE VAGINA is also exceedingly rare as a primary disease, although we constantly meet with it in the fornix as an extension of cancer of the cervix. This is easily explicable by the histological difference of the two contiguous regions. In 1885, Grammatikati[2] tabulated 38 cases of the disease; but Küstner, whose classical paper[3] on this subject is often quoted, rejects a number of reported cases as doubtful and reduces the number to 22, to which Olshausen has lately added 2 more. Beigel was able to collect but 14 cases out of 8287 examined.[4] In far-advanced cases of proliferating cancer of the cervix it is quite easy to mistake the disease as vaginal, for the cervix is here extremely difficult to reach and the vagina is filled with the deposit. Two years ago I saw in consultation an elderly lady where this condition was so extreme that it was only at the autopsy that the uterine origin of the malady could be verified. In such doubtful cases a careful rectal examination will often be of material aid, but not always.

Like sarcoma, cancer of the vagina occurs in two forms of development—as a diffuse infiltrating deposit which sometimes encircles the

[1] Vide Breisky: *loc. cit.*, p. 358, for details of other interesting cases.
[2] *Centralb. f. Gyn.*, 1885.
[3] *Archiv f. Gyn.*, ix. 279.
[4] Hart and Barbour: *loc. cit.*, p. 506.

canal as a ring-like constriction, or as a broad-based glandular or papillomatous tumor which is chiefly found in the posterior wall.

It has only once[1] been observed in childhood, so far as I know, but in adults has been found at all ages from twenty to sixty: most of the cases have occurred between thirty and forty, and two between fifteen and twenty. One (Bailly's) case has been complicated by pregnancy, the growth being discovered at the fifth month; during delivery it formed a serious obstacle, the child being finally removed with forceps, and five months later it proved fatal from exhaustion.

The SYMPTOMS are hemorrhage, purulent or watery discharge which is peculiarly offensive, and occasionally pain. The latter is rarely constant, and may occur only during coition or in straining at defecation. If stenosis of the vagina ensue from the advancing constriction, there may be superadded to these the results of pressure or strain upon contiguous organs.

Often in the later stages there is deep and rapidly advancing ulceration, which may perforate the vaginal wall and establish fistulous communication with the rectum or bladder.

The cachexia is as usual in all forms of cancer, and enlargement of the lymphatic glands often occurs. From the vascularity and softness of the vaginal walls the disease advances with great rapidity: it assumes usually the epithelial or vegetative form, but a few cases of true scirrhous cancer are on record.

If the above symptoms be borne in mind, the DIAGNOSIS of vaginal cancer can present but two difficulties—differentiation from sarcoma and from cervical cancer. The former is possible only by the microscope; in even the worst cases the latter can generally be established by careful rectal examination.

Although the ultimate PROGNOSIS is necessarily fatal, much may be done to palliate the patient's discomfort and even to lengthen her life.

The TREATMENT consists only in extirpation of the growth, or of as much of it as can be safely removed by the knife, curette, or galvanocautery. Breisky thinks its nugatory results have heretofore arisen from the difficulty of effecting complete removal of the growths; but, in addition to this, it may well be doubted whether in tissues as soft and vascular as those of the vaginal walls infiltration of the surrounding parts has not always progressed beyond the points recognizable by us. Its uniform return certainly indicates this probability. Still, extirpation should always be attempted, and if possible with the knife by excision in preference to other methods. If in this it be necessary to cut into the rectum or bladder, we should do so if there be a chance of closing the fistula thus caused. Schroeder has operated thus radically in three cases; and recently, in removing a cervical epithelioma with

[1] Vide Breisky's description of a specimen in the Strassburg Museum: *loc. cit.*, p. 360.

secondary cancer of the anterior fornix, I was obliged to dissect the latter out completely, but with careful drainage obtained good union by granulation; and thus far (four months after operation) there has been no return of the disease. If it be at all possible to close the resulting wound with sutures, this should be done; the risks of hemorrhage are thus lessened and the chance of union in the wound improved. With either knife or galvano-cautery the risk of primary hemorrhage is considerable, at least one fatal case (Grünewaldt's) being reported from this cause; with the sharp or blunt curette it is less, but the process is less effective. All the aseptic precautions and tonic after-treatment appropriate for other forms of cancer should here be adopted.

IV. Tuberculosis of the Vagina has been described by Klob,[1] Virchow, Deschamps,[2] Hegar,[3] and Schroeder: fourteen well-marked cases have been tabulated by Deschamps up to the end of 1884. It is, however, not only exceedingly rare, so as to be chiefly a medical curiosity, but important only as indicative of a general constitutional diathesis. Its characteristics are tubercles and tubercular ulcers on the vaginal mucous membrane, associated with the same condition in the lungs and in other parts of the body.

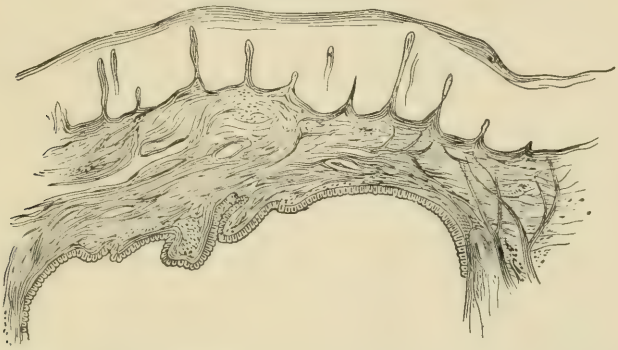
V. Cysts of the Vagina are much more frequently found than any other form of neoplasm, but are yet considered rarities by most writers. Von Preuschen[4] states that they have been found in six out of thirty-six cadavers examined for them. When small we probably fail to detect them in many existing cases, and Gräfe[5] thinks that larger ones are sometimes mistaken for conditions of incurable prolapse. They have been found at all ages, most frequently, of course, in middle-aged adults, as in them the vagina is most often examined; but in at least two cases recorded by Winckel and Breisky[6] they occurred in newborn infants.

They may be either single or multiple, Gräfe having reported a case from Schroeder's practice where "six cysts lay one below the other, the lowest projecting into the vagina, and arranged spirally from the right backward to the left and from the introitus to the fornix." Most often they are single, occurring indifferently in the upper, lower, or middle third of the vagina, and rather more frequently on the anterior wall. Of 61 cases tabulated by Gräfe, 29 were found in the anterior wall, 21 in the posterior wall, and 11 in the lateral walls of the vagina. In size they vary from that of a cherry or less to that of a goose-egg; in a very few exceptional cases they have been much larger, filling the entire vagina, J. Veit[7] recording one of the size of a child's head at

[1] *Path. Anat. der Weibe. Sexual-organ.*, Wien, 1864, p. 432.
[2] *Archiv de Tocologie*, 1885, p. 19.
[3] *Genital-tuberculose des Weibes*, 1868.
[4] *Real Encyk. der gesammt. Heilk.*
[5] *Zeitsch. f. Geb. u. Gyn.*, B. vii. H. 2.
[6] *Loc. cit.*, p. 342.
[7] *Zeitsch. f. Geb. u. Gynäk.*, viii. 324.

full term, and Noyes[1] another of the size of two fists. In the latter case the cyst had been known to exist for sixteen years, and grew from the anterior wall. The walls of these cysts may be either thick or thin, varying, according to Parvin,[2] from one centimeter to one millimeter in diameter; formed commonly of connective tissue only, they may also contain muscular fibres, and are lined internally with cylindrical epi-

FIG. 13.



Section of Vaginal Cyst. The cyst-wall, which is lined with a single layer of epithelium, is separated by some tissue from the mucous membrane, which is covered with many layers of squamous epithelium not detailed in the section (Schroeder).

thelium (Ruge). According to Gräfe,[3] they originate in Gärtner's canal or in a part of the duct of Müller, as retention-cysts in dilatations of the lymph-ducts, or they may result from œdemas or bloody effusions in the connective tissue of the vaginal wall. In addition to these sources of cystic development, Porak[4] has described a unique case of suppurating hydatid of the vagina. Their contents vary from a thin serous fluid to a thick, gelatinous formation, and may be either clear or straw-colored, or opaque and as dark as chocolate. Under the microscope this is found to contain oil-globules, granular cells, pus, blood, epithelium; sometimes cholesterin; sometimes no morphological elements at all are found. The presence of cholesterin gives an emulsion-like appearance to the fluid.

The SYMPTOMS of vaginal cysts, when of small size, will often be negative; when pediculated and projecting at the vulva or when large enough to cause pressure, they induce leucorrhœa, bearing-down sensations of discomfort, and dyspareunia. In two cases which I have removed from middle-aged subjects, and which have been published,[5] all these symptoms were extremely developed. In Dr. R. Watts' rare case,[6] where the cyst was developed from Gärtner's canal, there was much vesical discomfort and difficulty in micturition.

[1] *Boston Med. and Surg. Journal*, 1861.
[2] Ashhurst's *International Encyc. of Surgery*, vi. 712.
[3] *Loc. cit.*, S. 460.
[4] *Archiv de Tocologie*, 1884, 163.
[5] *Amer. Journ. Obstet.*, vol. xix.
[6] *Ibid.*, vol. xiv.

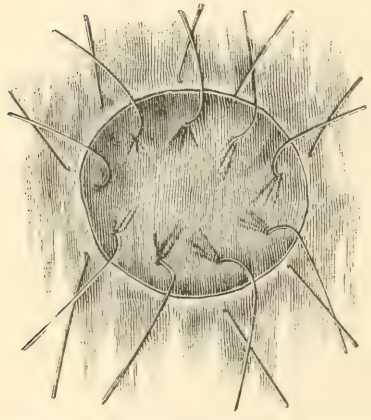
The DIAGNOSIS, except in very small cysts, should not be difficult. Their unmistakable sense of fluctuation and their smooth elastic surface combine to distinguish them from solid tumors and from either cystocele or rectocele. If in doubt, aspiration should be practised, and the fluid obtained will indicate the nature of the growth. When near the introitus vaginæ much care must be exercised to distinguish them from the retention-cysts caused by suppuration or obstruction of Bartholini's glands.

The PROGNOSIS is favorable, but in exceptionally large growths it must be given more guardedly.

The TREATMENT, to be curative, must be excision, either of the whole growth or of enough of the cyst-wall to destroy its lining membrane and to cause adhesive inflammation of its sides.

In the first of the cases I removed I was able to dissect out the cyst *in toto*, and, bringing the sides of the resulting cavity together with silver sutures, obtained excellent union. In the second I found this more difficult, as the cyst, which covered the whole lower third of the anterior wall, was deeply seated, and so intimately connected with the *bas-fond* of the bladder that I feared extensive injury to the latter in its dissection. Schroeder's method was therefore adopted, as advised by Hegar and Kaltenbach. This essentially consists in excising the most projecting part of the cyst-wall, together with the mucous membrane that covers it, emptying the cyst, and scarifying or cauterizing its lining membrane, and then uniting with sutures the margins of the cyst and vaginal wall, as shown in Fig. 14. As the sutures are tightened the cyst-cavity is rolled out until it becomes flush with the vaginal surface, after which it soon loses its distinguishing character and assumes those of the surrounding vaginal mucous membrane. Should hemorrhage occur—and it is sometimes quite copious—deep sutures form our best safeguard against it. The surface should afterward be supported by an antiseptic tampon.

FIG. 14.



Removal of Vaginal Cyst by Schroeder's Method.

NOTE.—Since the foregoing article was written a most comprehensive and intelligently-written paper, entitled "A Contribution to the Study of Cysts of the Vagina," has been published by Dr. George W. Johnston of Washington in the *Am. Journ. of Obstet. and Dis. of Women and Children*, vol. xx. Nos. 11 and 12, to which the reader's attention is particularly directed.

THE HYSTERO-NEUROSES.

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PART I.—GENERAL.

I. Definition.

By the term Hystero-neuroses I have designated those phenomena which simulate a morbid condition in an organ which is in an anatomically healthy state, and which are due not to structural changes in the organ in which they appear, but to morbid or physiological changes in the uterus and ovaries. The hystero-neurosis is a sympathetic hyperæsthesia, the result of reflex action due to uterine derangement, and demonstrated to be unquestionably so dependent by being intractable to direct local medication, but yielding at once to treatment of the causative pelvic disorder. These reflexes are most varied in character, being determined by the numerous ramifications of the ganglionic and spinal nerves and centres, to which morbid impulses are conveyed by connecting fibres from the uterine and ovarian nerves; they appear most frequently as nerve-pains central and peripheral, as changes in the circulation, and as gastric and cardiac symptoms. The direction of nervous influences like that of the electric current is determined either by the character of the conductor or by the terminal attraction: uterine irritation is transmitted either by such nerve-tract, which is already in a state of morbid irritability, to the organ supplied by its terminal fibres, or it is carried by the most direct course to such organ, which submits most readily to the morbid impulse, either by reason of its lessened resistance, an already lowered vitality, or an existing hypersensitiveness: both forces seek the most perfect conductor, and travel directly along such course to the point of greatest attraction, developing their full effect at the terminal radiations. Thus the irritation of the ganglionic nervous system, caused by morbid changes in uterine and ovarian tissue, is most readily conveyed to the spinal and cerebral

centres, following sometimes one, sometimes another path, and results in the lumbar or hypogastric pains, in the burning or pain in the top of the head or back of the neck: most intimate is the connection of the ganglionic with the vaso-motor nerves; hence changes in the uterine tissue influence, through the ganglionic centres, the vaso-motor nerves, and produce either relaxation, which is so often made apparent by flushes, swelling, heat and redness of the surface, or hyperactivity, marked by vascular contraction, by a chill or coldness of the extremities: by their connection with the vagus are brought about the palpitations of the heart, the nausea and vomiting, by which the stomach tells of uterine changes. The anastomosing fibres of the solar plexus account for the gaseous distension of the abdomen, the constipation and diarrhœa, by which uterine changes find expression.

These symptoms are entirely distinct from the transitory and variable ones of hysteria, which I am inclined to place among the cerebro-spinal affections, and which are but indirectly influenced by the uterus and its annexa. As hystero-neuroses, I consider only such appearances of disease, without structural changes in the organ in which they occur, which are the direct result of reflex nervous influence, dependent upon changes in uterus or ovaries, coming and going, aggravated or improved with corresponding changes in the determining causative disease. We must strictly eliminate coexisting symptoms and symptoms arising from direct mechanical causes: thus the stiffness of the leg, with the shooting pain which follows the course of the nerve, often found in ovarian and periuterine disease at the time of the menstrual period, is not an hystero-neurosis, not a reflex nerve-symptom, but the direct result of pressure by the congested tissues or the enlarged ovary upon the pelvic portion of the nerve: frequent and painful micturition, dysuria as it is observed during the menstrual period, may be a neurosis pure and simple, but it is more frequently the result of increased pressure of the congested uterus upon urethra or bladder. Such symptoms as are produced directly by contact, by pressure upon tissues, nerves, or vessels, must not be confounded with a neurosis, with those symptoms determined only by reflex nerve-action.

II. Various Forms of Hystero-neuroses.

As these reflex neuroses are due to changes, pathological and physiological, in uterus and ovaries, we may look for their occurrence in disease and during periods of heightened functional activity; hence I have classified the hystero-neuroses,

First, as pathological;

Second, as physiological.

The physiological neuroses are those reflex symptoms which appear

during the periods of increased functional activity at puberty and the menopause, during menstruation and pregnancy.[1]

FIRST.—PATHOLOGICAL HYSTERO-NEUROSES.

These are symptoms referable to, and caused by, a pathological condition of some part of the female sexual apparatus, aggravated by such causes as intensify uterine disease; they are usually heightened by, or appear only during, the periods of physiological congestion.

I shall treat here of the pathological neuroses or the reflex symptoms accompanying uterine disease, as I look upon these as the most important to the practitioner and as the most occult and least readily recognized.

SECOND.—THE PHYSIOLOGICAL HYSTERO-NEUROSES.

a. Hystero-neuroses of puberty; and *b. The menopause.*

These two most important epochs in the sexual life of woman, the coming and going of the menstrual period, are marked by increased susceptibility of the nervous system: the peculiarities of temperament, the freaks and nervous pains with which women are afflicted at these times, are well known in a general way, although they have never been thoroughly classified or understood. Even Tilt in his classical work on *The Changes of Life in Health and Disease*, in which he enumerates and graphically describes the neuroses of the menopause, confounds the neuroses pure and simple—of certain of which he speaks as gangliopathies—with the diseases proper of the menopause. If we glance for a moment at his tables, in which he depicts the relative frequency of morbid liabilities at the change of life in 500 women, we find nervous irritability in 459, flushes in 287, pseudo-narcotism in 277, dorsal pain in 226, gangliopathy and faintness in 220, headache in 208, abdominal pain in 205, perspirations in 201; but with these he names leucorrhœa, which is a disease, and not a neurosis, in 146 cases; an hysterical state in 146; flooding of the bowels, biliousness, gangliopathy or strange epigastric sensations in 49; phosphatic or lithic urine in 49; diarrhœa in 45; chloro-anæmia in 40; dyspepsia in 37; and so on. I have quoted this table—from which we see that those neuroses which are most common at the change of life are also among the most common of the pathological neuroses or the neuroses accompanying uterine disease—to show the existing confusion: symptoms which are peculiar to the menopause

[1] This classification is the most simple, though not strictly correct, as many of those neuroses which are thereby termed physiological because they accompany the physiological congestion, are, in fact, pathological, caused by morbid states of the uterus, but dormant until aroused by the heightened irritation of uterine disease plus physiological congestion. Yet I adhere to these terms, as they facilitate understanding.

are placed side by side with reflex symptoms which are among the most frequent evidences of uterine disease at all times—the most frequent reflex neuroses which are caused by disturbances in the female sexual organs, determined alike by pathological conditions, by the changes of puberty, menstruation, or the menopause.

Tilt in describing the diseases of that period has given us a most excellent sketch of the hystero-neuroses as they are found during the entire period of female sexual life.

c. The menstrual hystero-neuroses.

I have so termed those neuroses which appear at the time of the menstrual congestion, but in few cases only are they determined by the physiological state pure and simple in a healthy organ. They are mostly dependent upon inflammation or displacement, aggravated by the physiological congestion of menstruation, their peculiarity being that they come at this time only. They are often determined by pathological conditions which in themselves are insufficient to bring about the neurosis, and only with the increased congestion or heightened nervous susceptibility accompanying the menstrual state does the neurosis appear, the pathological condition in itself being insufficient to excite the symptoms which are at once developed by the additional impetus of the physiological congestion. It is upon the congestion and the increased nervous excitability of the menstrual state that these neuroses depend—greater pressure, increase of the causative irritation in the uterus, heightened functional activity, and greater susceptibility of the affected organ and its nerve-fibres; hence they appear not at the time of the sanguineous flow, but during the entire period of congestion, beginning from two or three days to one week before the appearance of the flow, and passing away two or three days after its cessation, often disappearing during its continuance, whilst depletion is in progress.

d. Hystero-neuroses of pregnancy.

Unlike the neuroses of menstruation, those of pregnancy appear more frequently in response to physiological changes pure and simple, and less often to an aggravation of the exciting pathological state caused by the heightened vitality and increased functional activity of the organ during the pregnant state.

These symptoms frequently appear, like the menstrual neuroses, with the congestion and enlargement immediately following conception, and cease with the evacuation of the uterine cavity and the consequent depletion and contraction. The more common hystero-neuroses of pregnancy are known as the doubtful signs of pregnancy; and so well known are certain of these neuroses and their connection with the pregnant state that they are looked upon as probable signs of pregnancy, and as the earliest signs: so frequent is their occurrence that

they have been looked upon as an evidence of pregnancy even by the laity, even by the ignorant among peoples civilized and savage, and by the obstetric writers since the time of Hippocrates. But with the progress of medical science, remarkable as it may seem, our knowledge of these interesting genito-reflex neuroses has retrograded, and these symptoms are not as well known now as they were to the Greek physicians of the earlier centuries. They are determined by that congestion and enlargement and changed nervous state which appears soon after conception takes place, long before visible and palpable changes are such as to assure us of the condition which exists. Though the reflex nervous phenomena, the hystero-neuroses, are among the first evidences of pregnancy, they are correctly known as doubtful signs, since, as we well know, they are merely the results of nutritive changes which accompany pathological as well as physiological conditions; and the same reflex may appear in response to the irritation conveyed to the nearest ganglia from an erosion of the cervix; from increased discharge, whether this be due to congestion and hypertrophy of the mucosa; from pathological or physiological causes: nausea and vomiting may occur, or the moral nature will be perverted alike in consequence of a flexion, an induration, a laceration, or a physiological tumefaction of the tissues, thickening of the mucosa, or closing of the os. The signs are doubtful, because they result alike from pregnancy and from disease.

III. Importance.

The importance of the neuroses, this varied conglomeration of symptoms, always peculiar, of which the genito-reflex neuroses are a part only, has never been fully appreciated, and, in fact, they have never been understood, never studied as a whole: a single group only, I believe, the cardiac neuroses, developed by Flint, has entered medical literature: no less important are the bronchial neuroses, the dermatoses and psychoses, the male and female genito-reflex neuroses, the nasal and anal reflexes, with others less frequent and less important. A trifling derangement in a sensitive organ, not sufficient to attract attention, to cause pain or even discomfort in the part affected, may be the exciting cause, and distant organs respond most violently to this slight abnormity, as the alarm-gong sounds in answer to the tap on the button of the distant station. The distribution of the sympathetic and the ganglionic systems, connecting in innumerable filaments with the ramifications of the spinal nerves, central and peripheral, leads to the most curious and unexpected reflex symptoms. These neuroses may be likened to the explosion caused in the magazine by the small spark which has ignited the fuse at a distant point: they are the symptoms by which pathological conditions,

generally insignificant in character, find expression in vital organs; and, whilst these phenomena may result from irritation of terminal nerves in any part, the most numerous and the most striking are those which appear in response to genital lesions.

An injury in one part of the body is marked by pain in another: severe attacks of asthma are often dependent upon a circumscribed hypertrophy of the mucous membrane in the posterior nares, intense headaches upon gastric disturbance; and, *vice versâ*, the stomach responds to cerebral changes. Among the best examples of this peculiar reflex nerve-action are the convulsions of childhood and the symptoms of hip disease caused by the adherent prepuce in the male infant.[1]

I merely refer to these well-established reflex phenomena as identical with that great class of neuroses which are referable to the female sexual organs and which I have described as the Hystero-neuroses; and I need hardly state the self-evident fact that in the highly-sensitive nervous organization of woman we find these reflex symptoms most frequent and intense, and that they are most fully developed in response to lesions of the sexual organs, the controlling influence in the functional life of woman. Whilst these symptoms have been practically ignored by the scientific physician, who has recognized but an insignificant group as the doubtful or early symptoms of pregnancy, they have been observed from time immemorial by the laity; and I may almost say that these neuroses of pregnancy, these doubtful signs of conception, have been accepted by the profession in acknowledgment of popular beliefs and of medical tradition from the time of Hippocrates. Thus the ancients mainly recognized the symptoms which have now become obsolete, such as salivation and the enlargement of the neck: the Roman matron cast a fillet around the bride's throat before and after the nuptial night, in order to discover whether marriage had been consummated or not—a tribute to the congestion of the thyroid in response to uterine irritation. Horse-breeders at the present day in certain districts measure the necks of their mares before and after they have been covered to determine whether the intercourse has been a fruitful one.[2]

The most common and best known of these genito-reflex phenomena is the morning sickness of early pregnancy, and this at the same time offers a striking example of the importance of the hystero-neuroses. To the ignorance of the reflex nature of this irritation of the stomach resulting from uterine congestion many a young life has been sacrificed:

[1] The convulsions of teething, which in the popular mind exist as an almost unavoidable accompaniment of this stage of development, are often reflex in their nature, the result of terminal nerve-pressure. The muco-cutaneous border, with its sensitive fibres, is a favored centre; anal fissures and urethral caruncles are characterized by reflex symptoms often more annoying even than the distressing local pains.

[2] Goodell: *Transactions American Gynecological Society*, vol. i. p. 211.

many a young wife, happy in the expectations of motherhood, has fallen a victim to the violence of reflex nerve-action, heightened to its greatest intensity in this period of female functional activity.[1] Too long neglected, this group of symptoms should at length receive the attention which it justly merits, and they should be accorded due prominence in medical literature on account of their manifold importance, which is (*a*) practical, (*b*) scientific, and (*c*) medico-legal.

a. Practical Importance.—A thorough understanding of these symptoms, these functional perversions in vital organs in response to trifling uterine lesions, is necessary, not alone to the gynecologist, but above all to the physician in his daily practice: an understanding of these symptoms is necessary, not alone for the diagnosis of uterine and ovarian disease, but for the correct treatment of the symptom, which is often far more annoying to the patient than the disease by which it is caused. To the gynecologist these phenomena are but curious accompaniments of uterine disease, and he naturally pursues the only correct and possible method of relief—the treatment of the local disturbance. But the general practitioner who fails to recognize the neurosis toys with health, if not with life: deceived by the perfect identity of the symptoms, deceived by this semblance of disease in a perfectly healthy organ, he treats that organ for the supposed disease, and treats it in vain. The stomach is irritated, the system is ruined by constant medication, and the uterine disease, which is completely ignored, grows gradually worse; the reflex symptoms are correspondingly aggravated, more powerful medication is resorted to, and thus the health of the patient suffers, if her life is not endangered, by the error in diagnosis—the mistaking of the mere semblance, the reflection, for the disease proper. Such cases are not recognized and are not reported; they are regarded as puzzling and obscure by the attending physician, and the patient as an hysterical crank: the disease is not an unusual one, yet all usual remedies fail; the sufferer passes from hand to hand, satisfied to continue existence as an invalid if death does not put an end to her suffering. Innumerable women have been treated for gastric troubles, mainly dyspepsia or nerve-pains, for cerebral disturbance, and for weak eyes, and have gone through the entire pharmacopœia—"taken whole drug-stores," as they state—until they have given up all hope of improvement, and have become resigned to their fate, simply because a trifling uterine lesion has been obscured by the violence of the reflex symptom, which is not recognized as a neurosis, but treated as a disease.

[1] Sad results such as this are unfortunately too frequent: equally sad, and still more obscure, are those cases of asthma, dyspepsia, headache, and mental derangement which resist all efforts of the physician and doom the sufferer to hopeless invalidism,—all because a simple uterine derangement, of which the supposed disease is but a reflex symptom, is overlooked or ignored.

Am I not justified in emphasizing the importance of these neuroses? The healthy organ in which the phenomena occur is treated to the death: the causative uterine disease is ignored, because no pelvic or hypogastric pains exist, because no irregularity of menstruation occurs, or because the reflex symptoms so far exceed the trifling pelvic annoyance that the patient demands relief from that symptom which causes the greatest suffering, and both patient and physician overlook the lesser uterine trouble. Several cases now under my care will best exemplify the importance of these symptoms to the practitioner.

Case I. *Gastric Hystero-neurosis: Failure of Medication.*—Mrs. M——, aged 34, laceration of the cervix; retroversion and descensus uteri, metritis and endometritis: four children, the oldest nine years of age. For the past eight years this patient has been under treatment for what every physician called gastric catarrh (neurosis of the stomach), constantly taking medicine, each of the four physicians who attended her in turn exhausting the pharmacopœia, until her stomach was weakened, her system debilitated; each one had given her particular orders forbidding such foods as he thought injurious; and whilst this poor woman, who needed nourishment and stimulation, was being medicated and starved, she was urged to exercise: her housework done, she walked or drove, and thus constantly aggravated the uterine disease. Backache or slight pelvic pains were ignored, and so treatment was continued until she was brought to bed by an exacerbation of the uterine disease; and even then the pelvic trouble would have been overlooked had not the extreme displacement of the congested uterus caused most painful dysuria, and caused me to be consulted on account of the bladder trouble. I found an ugly state of affairs: the ovaries were congested, the ligaments very much relaxed, the uterus greatly enlarged, the muscular tissue and the mucous membrane thickened and congested, so that I at once inaugurated treatment of the uterine and ovarian disease, regardless of stomach or bladder. As the uterine congestion was reduced and the position of the organ improved, both dysuria and dyspepsia were bettered; all medication was stopped, and this patient, who had for eight years been treated as a dyspeptic, dieted and medicated, was enabled to eat with the rest. I restricted her in no way, and she digested all foods alike, notwithstanding the weakening of the stomach by continued treatment and dieting.

The chronic uterine disease has improved very slowly; hence occasional attacks of dyspepsia still occur: these are not due, however, to the character of the food, but to the condition of the uterus; and at these times the stomach resents the lightest diet, milk and lime-water, precisely as it does heavier food. For eight years this patient has steadily aggravated the uterine disease by needless exertion, has weakened her constitution and ruined her stomach by careful dieting and

gastric medication, until her health is completely broken. Physician after physician attacked the healthy stomach for the semblance of gastric disease resulting from the comparatively painless uterine disturbance.

Case II. *Central and Peripheral Cerebral Reflexes: Failure of Direct Treatment.*—Mrs. B——, aged 32, a sufferer from constant headaches, with exacerbations which resulted in symptoms resembling mania. No pelvic pains, no backaches; menstruation regular; patient suffers constantly, and is under treatment by a local physician in her Western home; though now and then temporary improvement was visible, her condition grew steadily worse. The suffering, which had begun with dull headaches, attained such intensity that physicians were consulted in larger cities; she was plied with nervines and sedatives without the slightest benefit; her nerves were shattered, her stomach ruined, and her condition such that she rushed screaming into the street at night; and as a last resort the physician then attending suggested the insane asylum. No physician had ever examined the uterus or inquired as to the status of the reproductive organs, as every one was perfectly satisfied with her statement that menstruation was regular and her back free from pain. Influenced by female friends and by her own belief and hope in the possibility of a causative uterine disease, she consulted me. I found an indurated, hyperplastic uterus, with a large, hard cervix and the remnants of an old laceration, the ligaments indurated, and indications of a perimetritis at an earlier day. Nervines and sedatives were stopped and local treatment inaugurated. Whilst I have not been able to overcome the symptoms, they have improved very much: a constant headache remains, but the excessive nervous irritability and maniacal symptoms have ceased. Notwithstanding the long duration of the disease and the injury done the stomach and nervous system by chloral and even stronger remedies, a three months' treatment of the metritis and endometritis served to make life more comfortable, to relieve the more violent symptoms, and to give the hope of recovery to this patient who had been upon the point of being thrust into an insane asylum for the semblance of mental disturbance, these violent reflex cerebral symptoms resulting from an apparently symptomless uterine disease.

Case III. *Vomiting of Pregnancy: Resists Medication, yields at once to Uterine Applications.*—Mrs. X——, an only daughter, a bright, happy wife, pregnant with her first child, was attacked by nausea and vomiting; treated by various physicians, homœopaths and regulars, her condition grew steadily worse. The treatment, of course, was directed toward the organ affected with the semblance of disease, the stomach; medicine after medicine was tried; the vomiting grew worse, more frequent, until, when I saw her, without food for weeks,

this young bride, four months before the very picture of health and beauty, was upon the point of death, a haggard, emaciated wreck. Applications to the eroded and congested cervix and the inflamed mucous membrane stopped the vomiting within twelve hours; but notwithstanding this satisfactory response, death speedily followed, as the violence and long duration of the neurosis had sapped all vitality. I do not hesitate to state that if the causative disease had been treated in time, a few simple applications would have sufficed for the relief of the slight cervical catarrh and the erosion, which, by the violence of the reflex symptoms, proved fatal in the end.

These are indeed extreme cases, yet not altogether uncommon; and does not ignorance of these phenomena appear criminal when we see the persistent and misdirected treatment of the symptoms lead to years of suffering, to invalidism, and to death, whilst a few trifling applications to the uterus in the early stages would have afforded immediate relief?

b. Scientific Importance.—Important as a thorough understanding of these phenomena is to the practitioner, it is hardly less so to the student; as

1. It serves us in the correct development of medical science, the neuroses being the link which binds specialism and general medicine; and,

2. It is of value to the anatomist and physiologist in guiding him in the study of the anastomosing fibres of the ganglionic and spinal systems and their relative functions.

1. This era of medical specialism, to which we owe in so great a measure the marvellous progress of medical science and the brilliant developments in all its branches, has its faults as well; and the most grievous, which inevitably tends to deterioration, is the close limitation to specialism. The physician is lost in the specialist; the man of science becomes a mechanic who may be skilful in a laryngological operation or a uterine manipulation, but the system, the nervous organization, the circulation, the great vital forces, are forgotten in the one organ of the particular specialist, and no common bond exists between the specialists who treat these widely different parts. But, as Virchow has so justly emphasized in an address delivered some years ago, no man can be a thorough specialist who is not a good physician. The practical importance, the intensity, of these reflex phenomena demands attention, and forces the specialist from the narrow confines of a single organ upon broader ground, and necessitates a return to the thorough study of general medicine. Even more: this grand group of symptoms, emanating from an obscure localized irritation, affecting important organs most diverse in their phases, connecting distant parts by a chain of ganglionic and cerebro-spinal nerves, involving the system in all its

parts, forms a bond of union between the various specialties. It is a common centre toward which all must converge, a common ground upon which all may unite.

A gastric neurosis may be such as to puzzle the practitioner whether the stomach, the uterus, or the nervous system is at fault, and whether relief may be obtained by gynecological treatment, by gastric medication and diet, or by treatment of the nervous system. A neurosis of the eye will necessitate a careful examination of the eye, the brain, the kidneys, and the uterus. It is by concentration on the part of the scientific practitioner of the day that medical progress has been furthered; but this concentration soon tends to limitation, and whilst many are benefited not a few suffer. I have mentioned the sad case of a patient now under treatment for endometritis, metritis, and descensus uteri, who has been for eight years a sufferer from a gastric neurosis, and who has been under constant treatment for this most apparent symptom. Medication of course proved completely useless, yet it was tried again and again by physician after physician, as her failing health was attributed to the semblance of gastric disease, whilst the insidious uterine lesion escaped detection, as it was not announced by hemorrhage, menstrual pain, or backache, and slowly but surely progressed until it had undermined her entire system.

The ramification of the ganglionic and spinal nerves throughout the body may be compared to a network of electric wires; and whilst the irritation of the uterine terminals may find expression in chest or brain, the converse is equally true. The reproductive organs respond readily to a cerebral impulse by the intertwining of the ganglionic and cerebro-spinal system; morbid changes in the nerve-centres may determine functional changes in distant organs by the response of the terminal fibres to the central impulse; and in woman none respond more readily than those of the sexual organs.

The effect of sudden emotion, of joy or fear, upon rectal and vesical nerves is well known: uterine hemorrhage or the sudden checking of the monthly discharge or the flow of milk may be caused by a mental impression. It is not uncommon to see an amenorrhœa in emigrants: the change of life, the leaving of home and friends, produces a powerful mental impression, which results in a disturbance of the uterine function and consequent symptoms, such as backache and hypogastric pains; so that in this case we have a morbid condition of the nervous system marked by the symptoms of uterine disease which the thoughtless specialist would treat as such. More common and more striking is the picture so graphically drawn by Goodell[1] of the overtaxed school-girl, who begins to fail, loses her appetite, grows pale, is distressed by head-

[1] "Neurasthenia and Womb Disease," *Transactions of the American Gynecological Society*, vol. iii. p. 31.

ache, backache, spine-ache, and a sense of exhaustion; her catamenia, hitherto without suffering, become painful; her linen is stained by an exhausting leucorrhœa, and bladder trouble sets in; all the symptoms of uterine disease appear, and she is subjected to a painful examination and unnecessary and humiliating treatment. Now, whilst I will not say with Goodell, that "a moral rape is committed," the physician is guilty of a grievous error, and, as the author truly says, the patient drags herself from one consulting-room to another, until finally, in despair, she settles down on a sofa in a darkened room and lapses into invalidism.

Such are some of the sad results of confined and false specialism, best exemplified in cases of reflex neuroses, which are hence important to specialist and general practitioner alike; and I believe that the study of these symptoms will serve not only to check the narrow limitation of specialism, but to unite the practitioners of general medicine and the widely-separated specialists.

2. A careful observation of these phenomena must result in establishing much as yet undetermined in regard to the functions and ramifications of the ganglionic systems. By means of well-authenticated pathological facts the obscurities existing in anatomy and physiology may be cleared; hence the scientific importance of these reflex symptoms; and not until the anatomical relations and physiological functions of the various nerve-tracts have been traced from the terminal plates to the central ganglia will these curious reflexes be fully understood.

c. Medico-legal Importance.—The dangerous phases assumed by the cerebral neuroses give an aspect of legal import to the study of these phenomena (the hystero-neuroses), and upon the correct diagnosis of certain of these reflexes depends the good name, if not the liberty and even life, of the patient. The unfortunate invalid who is under the sway of irresistible impulses, whose actions are determined by a mere morbid reflection of uterine or ovarian impulses, is made to suffer alike with the wilful criminal unless protected by medical science. As early as 1845, English judges recognized the power of the reproductive organs upon the mind of woman (Tilt, p. 192), and they refused to inflict punishment upon the unfortunate mother who had murdered her child in an attack of puerperal mania.[1]

Most common among these central neuroses which may give rise to legal investigation are the actions of women under the influence of puerperal insanity, leading to infanticide, homicide, and suicidal mania, kleptomania, dipsomania, and suicidal mania, which appear either as

[1] Regina *vs.* Burk, Central Criminal Court, June, 1845. Murder of the child proven, but acquitted on the plea of being subject to disordered menstruation. Amelia G. Snoswell tried at Maidstone, March 20, 1855; acquitted on same ground.

pathological or as menstrual neuroses. The irritability, varying temper, and moral perversion accompanying uterine disease, and tending to exacerbation during the periods of physiological congestion, are liable to alienate the affections, to foster discord, and to force an innocent, loving wife into the divorce court.

Tilt truly says (p. 192): "Judges as enlightened as merciful have admitted the doctrine of uncontrollable impulses in cases of puerperal insanity; if they admit that parturition determines uncontrollable impulses, they must allow the possible occurrence of the same impulse at all the critical periods of woman's life—during puberty, pregnancy, lactation, at the menstrual period and cessation," and, I must add, in uterine disease as well.

I am justified, then, in my plea for a more careful study of the hystero-neuroses on the ground of—

(*a*) *Their practical importance to the gynecologist*, that he may detect uterine disease when the ordinary symptoms are wanting; to the general practitioner, that he may correctly diagnose and not maltreat, but overcome, suffering; and to the sufferer herself, who may be so easily relieved, and yet who so often becomes a lingering victim to the neurotic treatment of phantom disease.

(*b*) *Their scientific interest*, as they force the specialist from his narrow confines to the broad fields of scientific medicine, and serve to reunite the widely-separated interests of diverging specialties—as they aid the anatomist and the physiologist in tracing the anastomosing fibres of ganglionic and spinal nerves.

(*c*) *Their legal import*, by tempering the hand of justice and preserving the innocent and afflicted from the punishment of the guilty.

IV. History.

However well known the fact has been that curious symptoms on the part of various organs are referable to changes in the female genitalia, this knowledge has found credence among the laity alone: it is referred to by Greek and Roman writers. The neuroses as early symptoms of pregnancy alone have entered more fully into medical writings: alienists, more especially the French, have appreciated the influence of these organs upon the mind, yet the neuroses, as such, have never been fully appreciated; isolated cases, startling phenomena, have now and then been reported, but our textbooks do not accord the subject the attention it merits.

Hippocrates already mentions certain genital reflexes as symptoms of pregnancy: Marcé, Tuke, and others toward the end of the last century and the beginning of this have carefully studied the puerperal psychoses, and indicate their connection with changes in the reproduct-

ive organs; with the development of our physiological knowledge isolated cases of reflex disturbances were recognized, and during the last twenty years sporadic investigations have now and then appeared, but no decided progress was made, no permanent interest in the subject was aroused. Even the most important of these observations seem to have been doomed to oblivion.

A distinct series of hystero-psychoses has been described by Mayer of Berlin; Fordyce Barker, in his work on *Uterine Disease as an Exciting Cause of Insanity*, has cited characteristic cases; and Dr. Edgar Holden has described a most striking series of pharyngeal neuroses; but few, with the exception of the above mentioned, seem to have fully appreciated the existence of so well-defined a group of symptoms, characterized by their positive and striking dependence upon uterine or ovarian disease. Thus, Hodge in the sixth chapter of his work on *Diseases of Women* records cases which plainly belong among the hystero-neuroses as homologous with those which are decidedly hysterical, evidently without a proper appreciation of the causative relation in either case. Some such cases are mentioned by Tilt in his chapter on gangliopathy, and he places them on a par with those which are purely hysterical, and ascribes all to disease of the ganglionic nerves —diseases to which, he says, women at the change of life are especially subject. Both authors relate these cases indiscriminately and in such connection that it would but confuse the reader to refer to them. My attention was first attracted to this class of symptoms by the distension of the epigastrium which so frequently precedes the catamenial flow, and which I have described as the most common menstrual hystero-neurosis of the stomach. Since the appearance of my paper on the hystero-neuroses[1] the literature on this subject has rapidly increased, and yet I believe that it merits more careful investigation, and deserves a recognition in gynecological textbooks which is not yet accorded it.

Tilt in his work on the *Diseases of the Change of Life* describes these reflex phenomena most vividly, and, though he refers them to pathological or physiological changes in ovaries or uterus, he does not define the direct causative relation, nor does he clearly estimate this absolute dependence, since he seeks relief by medication and lays but little stress upon local treatment, which in a true neurosis is the direct and most efficacious means of cure, and, with the exception of sedatives, the only. He records the symptoms without fully appreciating their dependence, and considers them among the diseases peculiar to that period of life.

Esquirol frequently refers to the dependence of various forms and phases of insanity upon changes in the reproductive organs, the exacerbation of mental disease at the menstrual period, its inception at puberty

[1] *Transactions of the American Gynecological Society*, vol. iii., 1878.

or the menopause; yet rarely is a proof of the causative relation established by the restoration of a healthy mental state by gynecological treatment, and so only can the existence of a hystero-neurosis proper be proven.

The studies of Hegar are most interesting: he has been attracted to these marvellous phenomena by his observation of ovarian disease, and has pointed out to the profession the importance which attaches to these symptoms, which, by their diversity, unite upon themselves the varying interests of all branches of the profession.

Undoubtedly, these phenomena are determined mainly by the influence of the ganglionic nervous system: to the uterine ganglia an irritation of the terminal fibres is communicated, and thus the link is established by which the impulse can be directed toward any of the functional organs of the body, all organs of nutritive life being supplied with ganglia or a ganglionic plexus; the largest is in the pit of the stomach, the solar plexus; hence gastric neuroses are among the more common—distension of the stomach, faintness, perverted appetite; the vagus, itself an important tract, is in direct connection with the ganglionic centres, and carries the uterine impulse to heart, lungs and stomach, and no reflex, next to the gastric, is more common than the cardiac—palpitation, pain, and all the symptoms of heart disease. Few are more annoying than the bronchial, especially the asthmatic, attacks. This same nerve, so intimately connected with the ganglionic centres, is the bridge which connects this system to the spinal and cerebral centres, and admits of the direct transmission of the uterine impulse to the brain; hence the nerve-pains and mental phenomena. The ganglionic system directly follows the blood-vessels to the capillary circulation, so that we may readily appreciate the influence of uterine and ovarian impulse upon the circulation: the flushes, sweats, clammy coldness of hands and feet, are the expression given to uterine irritation by the circulatory system under the influence of the vaso-motor nerves.

No one neurosis is always referable to one and the same uterine or ovarian lesion, so far as I have observed. The irritation of the genital terminals I believe due to compression by the surrounding congested, hyperplastic, œdematous, or contracted tissues; and this is transmitted by the most available and homogeneous conductor to the point of greatest attraction. It may be likened to the electric current, which seeks through the network of wires the largest metallic surface over the most perfect metallic connection. The irritation of the uterine terminals is transmitted over nerve-fibres which are already in a state of morbid activity, and is thus guided to the nearest ganglionic centre, or it seeks, by the most direct path, a responsive central plexus, which is itself in an unstable equilibrium, with heightened susceptibility to impression, why, we cannot say. The effect of this compression is more clearly

demonstrated in the infantile convulsions which disappear when the cause is relieved by lancing a gum or by stretching the prepuce. In osseous structures the immediate site can be determined, and the surgeon gives relief by opening the unyielding canal. Yet I would not assume this as the one and only cause of genital neuroses, as is done by Ohr.[1] The cause may be an exposure of the nerve, as in an erosion, or a compression by congestion or hyperplasia from within; by a narrowing of the uterine canal by small growths, induration of the mucosa, or a flexion from without by superimposed structures: compression of the ovarian nerve-fibres is caused in the same way, especially by induration, chronic interstitial inflammation, yet I have rarely traced a reflex symptom distinctly to ovarian cause. This irritation of the terminal fibre may extend along the course of the nerve, and if continued for a length of time may result in a true morbid condition along the irritated tract.

CASE IV. *Continuance of Characteristic Hystero-neuroses after Removal of Uterus and Ovaries: Cure by Galvanic Treatment of the Causative Uterine Terminals.*—Patient was referred to the department for nervous diseases as an incurable after failure of all treatment, local and general, by the surgeon who had, with signal success, removed uterus and ovaries to save his patient, who had been rapidly failing with the development of a sarcoma uteri. After the operation her general condition improved steadily, her strength returned, and she was enabled to resume her usual duties in the enjoyment of good health. Such uterine pains as had existed before disappeared, or at least diminished; among others, a not infrequent neurotic reflex, a pain in the heel and ankle. This well-being was of short duration, although her physical condition seemed perfect, the pelvic viscera in a most satisfactory state —no cicatrization, induration, irritation, or tenderness, not even a scar visible. Certain of the reflexes, the hystero-neuroses, which had existed before the operation, and had temporarily disappeared after the removal of the uterus, returned, and increased rapidly to an intensity hitherto unknown: the pains in the heel and ankle were so severe as to interfere with her duties, and at times even to prevent walking or standing altogether; and, what appears still more strange, other characteristic uterine reflexes, which the patient had not known hitherto, made their appearance and attained unusual intensity, especially a burning heat in the top of the head.

As before stated, her previous attendant had exhausted all efforts, and, failing to afford relief, referred his patient as a hopeless case to the nerve department of the Polyclinic. Professor Hermann treated the affected parts, applying the sedative qualities of the electric current to the top of the head and to the feet. Now, mark the result: temporary

[1] "Genital Reflex Neuroses in the Female," *American Journal of Obstetrics*, vol. xvi., Nos. 1 and 2, 1883.

improvement followed, the patient experienced relief for some hours after the application, but invariably her pains returned, and she was obliged to seek relief again in renewed treatment, being at least able to walk since under Prof. Hermann's care.

I accidentally entered Dr. H.'s clinic whilst this patient was under treatment, and as the docter briefly recounted her history, and the fact that uterus and ovaries, which I had presumed to be the cause of her suffering, had been removed, I nevertheless desired to see the patient, and Dr. H. kindly transferred her to my care. Vaginal canal and pelvic tissues seemed to be in good condition, but as I looked upon the distressing symptoms as uterine reflexes, a corresponding treatment was accordingly inaugurated. Positive vagino-abdominal galvanism was applied, 20 milliampères for four minutes, with the median plate as negative pole on the abdomen. This treatment, directed to the irritated uterine nerves precisely as if the organ had been still in place, gave greater relief than all applications heretofore, and after the third séance the pains and burning in the head and the agonizing pains in the heels had almost completely disappeared. The pain was similar to that which the old rheumatic experiences in the toe of an amputated leg long after the member has been removed, with the exception that the former is a reflex, the latter a direct, sensation emanating from the nerve-stump.

The case is one of the most striking I have seen, and affords the most incontrovertible evidence of the continuance of reflex symptoms after removal of the exciting cause, and the dependence, in this case at least, of the reflex upon a morbid irritability of the uterine nerve-fibres, as proven by the treatment: in others such continuance may be due to hyperactivity or hyperæsthesia of the ganglia or nerve-terminals in the corresponding organ, as is especially the case in the eye.

The result of the various treatments employed is characteristic of the therapy called for in genito-reflex neuroses: 1, treatment of the symptom is useless; 2, sedative applications to the nerve-fibres at the distal terminus, at the site of the symptom, may afford temporary relief; 3, a cure can be effected only by removing the cause or by sedative action upon the causative uterine terminals.

V. Cause.

The exciting cause of genito-reflex neuroses is to be sought, I believe, in an irritation of the terminal nerves which is communicated to connecting fibres of the ganglionic or spinal nerves, and thus conveyed to the responding organ. Possibly the reflex irritation may be due to pressure upon the nerve-terminations within the uterine or ovarian tissue, caused by congestion, or to the distension of the peritoneal

covering by the enlargement of the organ. Either of these theories would seem plausible when we consider the coexistence of the reflex symptoms and the uterine engorgement preceding the flow, which is especially marked in uterine flexions and in chronic inflammations: the neurosis frequently appears two or three days before the menstrual flow, during the period of engorgement; it may cease during the continuance of the flow, to reappear for several days after its cessation. Under ordinary circumstances the uterine engorgement is relieved by the flow from the congested capillaries, and the reflex symptoms disappear, but when the catamenial discharge has been checked by local or general changes, disturbed menstruation, amenorrhœa, this means of escape is not afforded and the neurosis continues. A violent asthmatic attack is caused by a flexion of the uterus, and ceases within fifteen minutes after this flexion is overcome; the circulation is restored, but the congestion can be but little reduced in that time. The symptoms may result from the pressure upon the nerve-terminals in the fundus by reason of the congestion following the obstruction of the venous circulation, or, what appears more likely in this particular case, it may be due mechanically to pressure in the angle itself. In physiological as well as in pathological conditions we may expect pressure upon nerve-terminals from congestion or hypertrophy of tissue at puberty, during menstruation and pregnancy, at the menopause, and in disease; this may occur during the fluctuations in circulation previous to the final depletion, and when this occurs the reflex symptoms disappear.

Tilt refers reflex symptoms mainly to the ovary, likewise Hegar—especially Schroeder, who urges the performance of oöphorectomy for the relief of violent reflex symptoms, even, as he states, if disease of the ovarian tissues cannot be detected. The uterus he ignores, and yet the great mass of cases which I have described as hystero-neuroses, and proven to be such by their disappearance upon treatment of the uterine disease, were mostly referable to the uterus, few to the ovaries. However great the influence which the ovary is generally supposed to exert upon the entire system, especially the nervous organization of women, my study of the hystero-neuroses has proven most conclusively that the importance of the ovary in this respect has been over-estimated, and that it is the uterus in which the controlling influence centres.

VI. Diagnosis.

The differential diagnosis between the pathological state and a reflex neurosis, however simple it may appear to distinguish between disease and the mere semblance of disease, is not always easy. The afflicted

organ in which the reflex neurosis appears will be found in a perfectly healthy condition, with no structural changes, yet the symptoms of disease are so well portrayed that the most expert will be deceived, as the structural changes, often slight even in disease, cannot always be readily observed. Only the transparent structure of the eye admits of ready differentiation; in other tissues it is often impossible to distinguish between slight inflammation and a distension of the capillaries due to vaso-motor paralysis; and many of the vaso-motor reflexes present all the features of the disease proper. The difficulty of diagnosis culminates in the dermatoses in which phantom and disease blend; the reflex symptom presents even the structural changes of the disease, which is possibly itself only a vaso-motor effect.

It is the existence of neurosis or disease which must be determined: the link by which this is effected, however interesting from a scientific point, is of no importance to the practitioner. It is for him to determine the absence of structural changes in the functionally deranged organ, in order that he may not annoy his patient by injudicious medication, and to detect the immediate cause of the disturbance, in order that he may discover the morbid condition, perhaps otherwise not indicated, and by properly-directed treatment relieve the reflex symptoms as well as the local disease in the causative organ.

The existence of neuroses can of course be determined by the absence of structural changes in the afflicted part, but this is not always possible; we must resort to other means.

1. *A neurosis is probable and may be suspected—*

a, by the existence of violent symptoms without corresponding pathological changes or febrile reaction;

b, by the existence of lesions, uterine or ovarian;

c, by the failure of proper remedies to afford relief;

d, by the aggravation of symptoms in the afflicted organ corresponding to exacerbation of uterine disease.

2. *A neurosis is proven—*

a, if the symptoms are not aggravated by causes which are known to aggravate existing pathological changes in the organ affected. Thus the use of indigestible food will not aggravate a gastric neurosis, whilst the most violent symptoms may appear in response to a diet which would seem indicated in disease proper;

b, if the symptoms are aggravated by causes from which exacerbation of uterine disease may be expected;

c, improvement of symptoms upon treatment of uterine or ovarian disease regardless of any interference with the organ in which the neurosis appears;

d, by a cessation of symptoms upon improvement or cure of uterine disease.

VII. Treatment.

The treatment of the hystero-neuroses may be—

a, Curative: by the treatment of the causative disease; and

b, Palliative: by the use of nervines and sedatives, or the direct action of electricity upon the irritated nerve-tract.

a. The diagnosis established, the most satisfactory and correct treatment of a reflex neurosis, however violent, is the treatment of the causative uterine disease regardless of the neurotic symptoms. Mild remedies to mitigate the severity of the symptoms may be employed, but permanent relief or cure cannot be expected until efficient treatment of the causative disease is inaugurated. The neurosis may disappear after a few treatments with but slight amelioration of the genital trouble, or it may continue until an approximately normal condition is established.

b. A reflex neurosis may be relieved, and even overcome, by the administration of nervines and sedatives and by the use of electricity —by the sedative influence of the current upon the irritated uterine terminals; and, although this is by no means a method upon which reliance can invariably be placed, it is worthy of trial. Violent symptoms, such as bronchial or gastric reflexes, may yield to the bromides, but unless a successful treatment of the uterine lesion accompany this medication, a relapse is liable to occur. Since I have observed the instantaneous disappearance of persistent neuroses under the galvanic treatment of uterine or ovarian affections, I have repeatedly and successfully attempted their treatment by electric application to the uterine terminals; and I can say that if it be of importance to relieve the neurosis as speedily as possible, this should be attempted, and, as uterine treatment is inaugurated, the sedative action of the current should be applied to the nerve-fibres in the causative organ.

The morning sickness of pregnancy still resists the persistent efforts of medical science, for the simple reason that medication is persistently directed to the affected organ, and the phantom of disease is persistently plied with all the weapons from the great arsenal of our materia medica. Even in this simple case the strict causative relation of the reflex symptom to the uterine condition is rejected. Like all reflex neuroses, the morning sickness, and often the violent vomiting of pregnancy, yield readily and positively to local treatment. If it be a pathological neurosis, originating in a congested condition of the cervix, an erosion, or an endocervicitis, it will yield readily to treatment; if it be a physiological neurosis due to distension of the uterus, a scarification may prove efficient; but to a certainty this symptom will yield to an evacuation of the uterine cavity. We have no better example than the gastric neurosis of pregnancy for guidance

in treatment of the hystero-neuroses: relief of the most violent vomiting may be obtained by a single application of carbolic acid to the cervical canal or of a tannated tampon to the eroded cervix. It may not yield at once, a prolonged treatment of the local lesion may be necessary, but the symptoms are mitigated as local improvement is obtained. Heroic medication of the stomach is not only useless, but injurious. Nervines and sedatives may afford relief, not by medication of the gastric mucosa, but by allaying the reflex irritability of the nervous system. A complete deadening of the gastric nerves by cocaine will, as a rule, afford only temporary relief, whilst this astringent sedative applied to the cervix is more likely to attain the desired result. It is by action on the uterine terminals that the rebellious stomach must be quieted, and not through the gastric nerves. If gastric medication were abandoned and uterine treatment inaugurated, little difficulty would be experienced with this frequent and annoying symptom, which the obstetrician is glad to escape; so much so that in one of the latest and most able works the author advises the physician "to send the patient to her mother;" in other words, get her out of the way and don't attempt treatment; and Lusk takes the same view of the subject. Cure is certain, but through the uterus only, and if other means fail premature labor must be inaugurated. Gastric medication as an adjuvant is not contraindicated, but violent treatment of the stomach must be condemned as useless and ruinous.

Schroeder advises the removal of the ovary, notwithstanding the absence of structural changes, for the relief of these perplexing reflex symptoms. It is now, however, generally accepted that removal of the ovaries is only admissible after all efforts at treatment have failed, and, let me add, after the sedative action of galvanism has been tried. But as the cause is by no means in the ovaries alone, the patient cannot be certain of relief even after she has made this sacrifice and has risked her life upon the assurance of her physician that oöphorectomy was her only hope. The uterus is more liable to influence the system and to determine nerve-reflexes than the ovary: this position has been proven by those cases in which suffering continued after removal of these organs; and because the neurosis in other cases has abated in course of time, the advocates of this course claim justification. I believe that relief may be so obtained, though the causative lesion is uterine, and not ovarian, as the *indirect* effect of oöphorectomy; involution follows this operation, a lessening of the uterine impulse results, and hence we may expect relief, though the ovary itself is not directly causative.

VIII. Prognosis.

The prognosis in a hystero-neurosis, however violent, is favorable, as a rule, though it is impossible to predict with certainty. Until the immediate cause, the local nerve-lesion, is revealed, the prognosis is shrouded in mystery and can be told by the result only. At times relief of the most violent symptoms is sudden, the result of a trifling interference, without any very apparent improvement in the local condition: a single astringent application, a rectification of position, may cause the most annoying symptoms to vanish. Again, it is slow, coming only with visible improvement in the uterine condition. I have seen the most distressing epileptiform attacks cease instantaneously upon a dilatation of the uterine canal; a persistent melancholia with excessive nervous irritability yield within a few hours after the closing of a lacerated cervix; even a sallow, sickly hue of the face, which had persisted for years, changed within a few days to a fresh, bright complexion after a conical excision of the cervix for the relief of laceration and hyperplasia. The vomiting of pregnancy, which had emaciated the sufferer to the last degree, ceased upon the application of the tannated tampon; likewise, a pessary or a tampon properly applied will produce an immediate response in lung, heart, or brain. I have seen an agonizing asthma cease shortly after the placing of a pessary, intense cardiac pains and insomnia vanish upon the insertion of a tampon, and a single application of electricity cause a violent dyspnœa with great nervous depression to disappear, even during the application, whilst the patient was still upon the table, though haunted by suffering and reduced to invalidism for over two years. Again, the improvement comes but slowly with restoration of a healthy condition of uterus and ovaries; or, if it has existed for any length of time, the neurosis may abate but slowly, to cease long after the local lesion has been overcome. This is especially noticeable in those neuroses and psychoses resulting from laceration of the cervix and its sequences; as after oöphorectomy the neurosis may not disappear until many months subsequent to the performance of Emmet's operation; but, as a rule, unless it has been most violent in character and has continued for a long term of years, complete restoration of healthy functional action and permanent relief may be expected upon proper treatment of the causative uterine lesion. If the neurosis has been severe and long continued, a weakness of the nerves implicated may remain and the morbid action of the governing ganglia, so long continued, may be perpetuated. In a case of gastric neurosis which had continued for eight years I was astonished to find the stomach in a fairly healthy condition, notwithstanding eight years of medication and diet and the constitutional debility of the patient. A certain weakness may

be expected to remain in those cases, and in some a perverted nerve-action is likewise perpetuated. Even violent psychoses, such as mania, melancholia, and epilepsy, will disappear completely upon relief of the uterine lesion, but the reflex neuroses of the eye offer a less favorable prognosis: if continued for a length of time a weakness of that important organ is likely to remain, and in certain forms of ophthalmic neurosis, though of short duration, functional changes are perpetuated. With this exception the prognosis of the reflex disturbances referable to the female reproductive organs is an excellent one, provided the part be not abused by misdirected treatment and the efforts of the practitioner centre upon the causative genital condition.

PART II.—SPECIAL.

HYSTERO-NEUROSES OF INDIVIDUAL ORGANS.—THE VARIOUS REFLEX FUNCTIONAL DISTURBANCES REFERABLE TO THE FEMALE SEXUAL APPARATUS.

I. Nervous System.

The impressionable nervous system of woman is the most susceptible of all organs and responds most readily to peripheral irritation, and every vibration of the nerve-fluid in the genital terminals meets with a sympathetic reverberation, and is often re-echoed a hundred-fold, in the spinal and cerebral centres, which reflect even the physiological action of the reproductive organs. During the entire period of female sexual life variations of any kind in these great centres, in which the functional life of woman is concentrated, evoke a ready response in the nervous system. So intimately are these two most potent factors of the female organism linked that, whilst the nervous system signalizes uterine and ovarian changes, the sexual organs respond readily to central vibrations: nervous debility is marked by leucorrhœa and uterine pains; powerful nerve-impressions, by hemorrhage or cessation of the physiological flow.

Perverted action of the nervous system, which appears as a reflex symptom in response to a morbid uterine or ovarian stimulus, may be either central, on the part of the brain, or peripheral, on the part of the spinal nerves. The peripheral neuroses or nerve-pains are more common as constant or pathological neuroses referable to uterine or ovarian disease; whilst the central neuroses, psychoses, more frequently signalize physiological waves, and result from the powerful impressions made by the great epochs in the functional life of woman —puberty, menstruation, parturition, and the menopause.

1. *The Brain; Cerebral Hystero-neuroses or Hystero-psychoses.*

Uterine or ovarian disease is frequently characterized by nerve-depression or irritability, loss of memory, insomnia or uncontrollable desire for sleep in the daytime, vague fear of misfortune, and dread of insanity. These are the mildest and most common of the central reflexes. Perversions of the moral sense, epileptiform attacks, melancholia, and mania are the more severe forms which are referable to the physiological changes, menstruation, parturition, and the menopause. It is difficult to draw the line between ganglionic reflexes and true cerebral symptoms. The neuroses present so true a fac-simile of the diseases which they simulate that the differential diagnosis is difficult. Continued observation or treatment, the recurrence of an attack with each menstrual period, or the improvement of the condition upon the inauguration of uterine treatment, indicates that it is a reflex symptom, a neurosis, and that all therapeutic efforts must be directed toward the relief of the uterine disease. I must emphasize that I confine myself exclusively to those symptoms which are proven to be strictly dependent upon uterine or ovarian irritation and respond to changes in these parts as readily as the electric bell does to pressure upon a distant button. These psychoses, though presenting a complete perversion of moral and mental faculties, are distinguished from the true central lesion by the favorable prognosis of the one and the dark future of the other: whilst the reflex symptoms readily yield to proper uterine treatment, the true psychosis is of a much more serious nature. Whilst the fact has always been appreciated that a certain relation exists between the impressionable mind of woman and the reproductive organs, whilst it has been well known that the diseases of the mind in their development and in their various phases are closely connected with the vibrations of sexual life, but little positive evidence has been introduced as to the direct dependence of the mental state upon the uterine condition; much less have those forms of insanity been defined which are mere reflections of functional derangement or of disease and malposition of the womb. I must say, as I did in my first paper on the hystero-neuroses, that the causative connection, though vaguely evident, has as yet been distinctly defined by only a few.

Alienists have always acknowledged an influence of the sexual organs upon the mental functions—all works on insanity bear evidence of this—but the statements made are generally very vague; thus Bucknill, Tuke, Esquirol, and others cite those frequent cases of sexual excitement and the disgusting exhibitions of many insane patients as instances of the dependence of mental derangements upon disorders of the sexual organs.

Such cases may be entirely excluded, as venereal excitement is not

only *not an indication*, but even *a rare concomitant*, of the hystero-psychoses. Other alienists, however, relate well-marked cases which distinctly show the causative connection, and insist on the importance of uterine examinations in the treatment of the insane.

Esquirol refers to the frequent exacerbations of mental disease, its occurrence and recurrence at the period of functional activity in the reproductive organs; yet he does not appear to appreciate the immediate causative relation, and certainly does not limit his treatment to the treatment of the uterine state. Gynecological textbooks give us but little information upon this point. Our earliest knowledge we owe to Louis Mayer[1] of Berlin, Fordyce Barker of New York, and Horatio Storer[2] of Boston, but within the last decade both gynecologists and alienists have been attracted to the intricacy and importance of these peculiar phenomena: from the great number of striking but still unexplained observations we shall soon be able to determine with greater certainty the extent of the influence exerted by genital changes upon the mental state; and the accumulated evidence indicates an undoubted causative dependence in certain cases. But among the numerous publications which have resulted I must note one on account of the peculiar position taken: *Gynecology, Neuroses, and Psychoses: A Protest against Reckless Gynecological Treatment for Nervous Disorders*, by L. Bremer, M. D. Does it not appear strange that an alienist should complain of the encroachment of the gynecologist, as injury can be done only by an ignoring of the reproductive organs? If uterine disease should exist as a concomitant of mental aberration, local treatment of the existing disease is unquestionably indicated, whether the psychosis be in any way dependent upon it or not; if a morbid condition of the reproductive organs exists, this must be relieved, whatever its relation be to the mental disturbance; and should the latter be a resultant reflex symptom, the only possible correct course has been taken. No harm can be done by the uterine treatment, and, though there be no direct causative relation, the mental disturbance will often improve, as it does with the improvement of any functional derangement, as an exacerbation takes place during the period of uterine congestion during menstruation or pregnancy, though there be no direct causative connection. But the alienist who overlooks a causative local lesion and treats a reflex symptom as a true psychosis does his patient a criminal wrong. It is perhaps a difficult task to eliminate the hystero-psychoses proper, those cases of mental alienation which have been proven to be dependent upon and caused by uterine disease: if they are not rare, they are at least little known as yet, and will remain so until uterine examination

[1] *Die Beziehungen der Krankhaften Zustände und Vorgänge in den Sexual-Organen des Weibes zu Geistesstörungen*, Berlin, 1869.

[2] *The Course and Treatment of Reflex Insanity in Women.*

and therapeutics become an acknowledged factor in the treatment of the insane; the relation can be established with certainty by the crucial test of treatment only. The nervous system and the reproductive organs, these two governing centres of female life, co-respond even when not in direct causative relation. A sympathy exists, as it is marked by the exacerbation of mental disease with pregnancy, menstruation, and the menopause; hence it is difficult, if not impossible, to determine fully the precise relationship, and to differentiate between direct causative connection and mere correspondence or sympathetic exacerbation.

Uterine disease may accompany the mental affection, and yet in no way influence its course; and, again, morbid brain-action may be the causative element which produces irregularities in the functional activity of the sexual organs.

The labors of Schroeder in this direction deserve to be better known. He has carefully observed two hundred and twelve female patients during a six years' service in a well-regulated insane asylum, and finds the large majority of these women afflicted with menstrual irregularities.

When menstruation was normal, he found the mental aberration but trifling; incipient mental derangement was generally accompanied by the appearance of some abnormity of the previously regular catamenia, which became more patent as the insanity developed; but in no instance was the patient restored by regulating the menstrual flow.

The author makes the existence of a certain sympathetic relation between these organs very evident, but in his cases the menstrual derangements seem to be secondary to and dependent upon the psychoses.

Classification.—Whilst we may classify the hystero-psychoses, like all of the neuroses, as constant or pathological, those due to morbid conditions on the one hand, and on the other those accompanying the physiological states of puberty, menstruation, parturition, and the menopause, it is true of this group, as it is of all hystero-neuroses, that the impression is often referable to a pathological condition more or less marked to which the nervous system has accommodated itself, and hence it responds only to the exacerbation of this pathological state by the additional impulse of the physiological congestion. The indications for the treatment are correspondingly well defined—a search for the existing uterine deviation, and relief, or at least relief of the temporary congestion, and if this prove ineffectual a systematic quieting of the uterine nerve-terminals, by the galvanic current. I cannot refer certain of the mental conditions to certain uterine or ovarian lesions, though one period seems to tend more to the development of one psychosis than another. But if a weakness exists, a tendency to a certain form of cerebral disturbance, this will be developed by a morbid intensification of the uterine stimulus, and, though it be allayed and a healthy

action restored, the chain is established, and the return of genital irritation at however late a period will be marked by the same cerebral response. The woman who in childhood has been affected with chorea may expect a return of the disease with the advent of puberty or of pregnancy if her nervous system be in a sensitive state or a pathological variation accompany the physiological congestion of the sexual organs. A psychosis which has appeared at puberty may be looked for as an accompaniment of the menstrual congestion or the menopause at any time that conditions exist which favor a morbid hyperactivity. The intense nervous excitement of menstruation may develop into maniacal symptoms with the increased congestion of pregnancy. I have seen symptoms of melancholia develop with the advent of puberty in a girl, who had inherited an excessively sensitive nervous system, which had caused her much annoyance in childhood; I have seen both melancholia and mania developing in one parturition repeated at the next; but, what is more sad, a maniacal attack which had persisted for three months at puberty, and had left the mind of the sufferer free throughout all her functional life, returns at the menopause, and under peculiarly unfavorable external conditions is threatening to become permanent. Had the surroundings been favorable, as they were at the time of puberty, I am sure that this second attack would have passed off as readily as the first.

I can but quote the words of Fordyce Barker in speaking of those cases of insanity which are developed immediately after marriage as the most pitiable of all the conditions under which insanity is developed, as a reflex irritation of the brain from disease of the sexual organs; and here again I recall such recurrence in a bright, healthy, happy bride of an attack of melancholia to which she had been a victim during two months at the time of puberty: with the first nuptial embrace the cloud which had been lifted again settled down upon her.

Symptoms.—Mental and nervous phases which reflect a morbid state of uterus or ovaries well known to every physician are the nervous prostration and mental depression and irritability which form so common an accompaniment of pelvic disease and are so indicative of functional changes. Tilt found these conditions in 459 out of 500 of the patients examined by him for irregularities at the menopause. This lack of energy, listlessness, nervous depression, as well as excessive irritability, are perhaps the most frequent of the mental reflexes: then come the loss of memory; insomnia or an irresistible desire for sleep during the daytime; a depressing fear of something terrible about to happen: a dread of insanity, a frequent resultant from uterine disease, is also one of the most common psychoses of pregnancy, and a sad burden to the young wife, who, oppressed with the vague fear of death, instead of looking forward with joy to a happy future, is in tears, depressed,

certain of a fatal termination of the expected labor. Complete change of the mental, and even the moral, state is a reflex common alike to disease and physiological changes: a girl with a bright, happy disposition becomes depressed, downcast with the advent of puberty, to resume her natural cheerfulness when the menses have been fully established; an amiable, cheerful woman becomes discouraged, dissatisfied, believes herself deceived by her friends, offends and insults those nearest and dearest to her during the exacerbation of uterine disease by the menstrual congestion; a bright disposition yields to peevishness or melancholia through disease or the physiological changes of pregnancy or the menopause. The more intense psychoses, deep-seated melancholia and mania, are more liable to reflect the intense physiological changes of parturition, puberty, or the menopause, and these intense morbid delusions find expression in suicidal attempts or murderous attacks upon a newborn infant. Delusions are often referable to pathological changes, but become more marked by the increased stimulus of menstruation or other physiological congestions; hence they are more frequently referred to these conditions than to their true cause, the pathological change in the reproductive organs. We are guided in our diagnosis of a hemiplegia or a paraplegia, reflex in its nature, by the fact that the disease proper is most liable to occur in old age, whilst the symptoms as a reflex psychosis appear most commonly in the young. In the male child it is almost a characteristic mark of the adherent prepuce, while in infants of both sexes it may appear as the result of intestinal irritation; and again we see these symptoms at puberty until a healthy functional activity of the reproductive organs is established. Like chorea, aphonia, lameness of the limbs on one side, more or less marked hemiplegia or paraplegia, but most commonly the former, is found most frequently during the period of development: numbness, tingling of the extremities, especially the fingers, are more likely to appear as an evidence of disease. Among these psychoses are the maniacal attacks which reflect the intense genital stimulus of marriage and parturition; the melancholia of puberty, the thoughts of death which haunt the expectant mother, and the mental and moral perversions so frequently accompanying uterine disease, but characteristic as well of the inauguration of woman's sexual life and the terminal period, during which love is changed to hate, a kind, gentle disposition to one that is treacherous and malevolent. Tilt has already told us that much domestic unhappiness is due to morbid uterine stimulus, as an ugly disposition takes the place of one heretofore passive and gentle; the kindly mother grows indifferent to her child; the thrifty housekeeper appears as a spendthrift: in short, the good qualities are perverted, and such evil impulses as may have lain dormant take full possession of the unfortunate victim.

I have cited only such of the psychoses as I have myself observed,

and, as is but natural, these are the less violent: the more intense are referred to the alienists; and, unfortunately, notwithstanding all that has been written, the full importance of these reflexes is by no means sufficiently appreciated by them, and patients who are brought to the asylum or to the specialist with maniacal attacks or the more marked forms of mental disturbances are treated for the disease which is so closely copied by the reflex phantom. The full bearing of the reflex irritation is not acknowledged, and they are dosed with nervines, whilst the speculum, by which the causative disease may be so easily relieved, is not thought of. Hence, with the exception of puerperal mania and those comparatively rare attacks which occur whilst the patient is under the care of gynecologists, those who suffer from this phantom disease are merged with the great mass of the insane or the mentally afflicted, and, notwithstanding the observations and the writings of such keen observers as Esquirol, Mayer, and others, who constantly call attention to the undulations of mental symptoms with the functional waves of reproductive life, the positive dependence is not established; hence the key to the relief of the fettered mind is not yet found, and it is impossible to say how frequent are the more violent of the reflex psychoses.

Violent epileptiform attacks, among the most intense of the reflex symptoms, and, as a rule, referable to pathological conditions, occur also during pregnancy and menstruation, and are even then referable to some pathological change in the uterus.

Case V. *Aphonia, Chorea, and Hemiplegia, due to Amenorrhœa during the Advent of Puberty.*—Miss X——, from Buffalo, who had suffered from a light attack of chorea minor during early childhood, was brought to me with many of the symptoms of hemiplegia, a beginning return of chorea, and an aphonia which was complete for hours at a time.

An unusually sweet and amiable child, an only daughter, having been treated for several months without benefit, her mother was in great distress; the diagnosis, however, was simple: the girl in her fourteenth year had grown rapidly and was fast developing into womanhood; her figure was developing; a faint flow had appeared several times at irregular intervals; and the symptoms varied greatly in intensity with the most complete semblance of disease when under the influence of the emotions or after bodily exertion. The movements of the tongue were at all times imperfect, but when tired or excited by an unexpected noise or the sudden entry of a visitor the aphonia was complete. At times the limbs relaxed as if paralyzed; at times they twitched under the uncontrollable tremor of chorea. She had been treated for several months with such remedies as are usual in cases of chorea, and, as is so commonly done with young girls suffering

with the symptoms, direct or indirect, of uterine disease, she was urged to take exercise in the earlier stages of the disease, to ride, to see as much company as possible; that is, mind and body, which needed rest, were forced to exertion, and the irritation of the sexual organs was increased. I looked upon the symptoms as purely of a reflex nature; and they were proven to be so by the good result of the treatment directed only to the establishing of the menstrual function: abdominal and spino-abdominal faradism was applied, as I believed it right to attempt this, and not to inaugurate a direct uterine treatment unless absolutely necessary; at the same time the current was applied to the spinal column, the cervical nerves, and to the neck. But although this may have afforded relief, the cure is unquestionably due to the development of a healthy menstrual function by abdomino-spinal faradism. Within six weeks the young lady left for her home with full control of all her muscles, the menstrual flow free, without a trace of the symptoms but a short time ago so threatening.

Case VI. *Left Hemiplegia, Partial Aphonia, Choking Sensations, Tingling of the Extremities, Mental Depression, due to Amenorrhœa during Puberty.*—Miss L——, from Alabama, a young lady of 16, of good figure, but imperfectly developed: the case was similar to the last, the chorea of the one being replaced by a hemiplegia, at times well marked, in the other. Although the amenorrhœa might have been referable to chlorosis, the existence of an endocervicitis and slight endometritis, with aggravated virginal anteflexion, rendered the dependence of the distressing reflex symptoms upon morbid uterine conditions more plausible, and the retarded development seemed referable rather to the disturbance in the genitalia. The correctness of the diagnosis was soon verified by the result of local treatment: utero-abdominal faradism, vagino-abdominal faradism for the purpose of stimulating functional activity of the uterus and ovaries, and negative utero-abdominal galvanism, with currents of 15 to 25 m. a. (5 minutes, cotton-wrapped applicator as negative pole in utero, medium plate as positive pole on abdomen over fundus, 9 volts), as a direct uterine stimulus, and a mild alterative application to the lining membrane: tonics were also given. After the second treatment the menstrual flow appeared, the first in the past six months, and with it came an amelioration of all the symptoms: heaviness of the tongue and hemiplegia disappeared; choking sensations, tingling in the extremities, though lessened, still persisted, and yielded but slowly during the six weeks' treatment, disappearing with the endocervicitis. The cure of the slight uterine abnormity, the improvement in the circulation of the pelvic viscera, first marked by the coming of the menstrual flow, seemed as by a sudden impulse to stimulate retarded development, and this girl, in whom the period of puberty had so long continued, bloomed forth

all at once, and the child that came returned to her home a woman, as her mother wrote to me.

In this case the symptoms were in part due to imperfect functional activity, in part to morbid conditions; the more marked psychoses, melancholia and hemiplegia, yielded at once with the appearance of the monthly flow, whilst the tingling of the extremities and choking sensations, being dependent upon the endocervicitis, resisted until this had been relieved.

Case VII. *Menstrual Psychosis; Melancholia with maniacal attacks accompanying the menstrual congestion, continuing for ten days, returning regularly with each period after the first appearance of the psychosis immediately after marriage; Uterus duplex, retroversion, endometritis, partition of the vaginal canal; Treatment of the local lesion regardless of the mental symptoms; Cure.*—Mrs. K——, from Illinois, farmer's wife, 24 years of age; strong, of good constitution, and well developed; can recall no symptoms in her earlier life indicative of uterine or mental disturbance with the exception of slight menstrual pains. Consummation of the marital rights was followed by an attack of melancholia, a strangely-changed mental condition; and this attack returned with each menstruation, continuing for a period of from eight to ten, and sometimes fourteen, days; she was depressed, sad, the symptoms as described by her husband giving evidence of well-marked melancholia. She seemed to attend mechanically to the more necessary household duties, being perfectly rational in the brief intermenstrual period, in full control of her mental faculties, willing and able to attend to her work: to all appearances in perfect health and sound in mind. During the last months her melancholia, this reflex menstrual psychosis, began to assume a more threatening aspect, taking the form of low maniacal attacks: the usual treatment had been inaugurated, the attending physician evidently regarding the case as one of mental aberration. Dr. Binney of Mount Olive, Illinois, being consulted, was at once led to suspect the reflex nature of the disease by reason of the monthly recurrence and its development at the time of marriage, the local lesion being indicated by the existence of spinal and hypogastric pains; hence he referred the patient to me.

January 13, 1887, I saw this lady for the first time: examination revealed a uterus duplex, both fundi enlarged, on the floor of the pelvis, retroflexed and retroverted; the external os and cervical canal in each very narrow and the endometrium diseased. Treatment, however, was impossible until the vaginal septum had been removed, as it rendered the organ on the left inaccessible. January 14th the vaginal septum was excised under antiseptic precautions, and the electro-cauterization of the cavities of both uteri undertaken: the negative pole, a delicate copper probe, with a current of 50 m. a., was applied to the endo-

metrium, and after this the largest possible instrument, an ordinary sound, was introduced into the cervical canal with a current of 100 m. a. for three minutes, and forced toward the internal os for the purpose of dilatation. The bowels had been thoroughly evacuated, the parts were dusted with iodoform, the fundus was elevated with the elastic tampon, and the patient instructed to lie in the semiprone position; before the wound had healed, and before further treatment was possible, the menstrual flow came on without any of the usual accompaniments, without any untoward symptoms, direct or reflex; the patient was comfortable and quite rational, perfectly quiet, not even nervous, her eyes clear and bright. During the following intermenstrual period she remained in the hospital department of the Polyclinic and treatment was continued—galvanism, negative electro-cauterization of the endometrium, with mild astringent applications, and the elastic tampon to overcome the displacement.

Mrs. K—— proved one of the most satisfactory patients we have had under treatment: careful in obeying instructions, quiet and clear-headed, entirely free from the annoying nervousness so common to uterine disease, the local condition rapidly improved: a second menstrual period passed off without the slightest evidence of any irregularity, either direct or reflex, uterine or cerebral. The patient was not dismissed, however, as I desired to keep her under observation until a perfectly normal condition of the pelvic viscera was attained. Devotedly attached to her husband, she gave way to an intense home-sickness against which she had long struggled; daily she grew more anxious to return to her home, and this intense anxiety culminated in a relapse into that state of melancholia which had previously been the accompaniment of the menstrual congestion. Her husband was telegraphed for, but before he arrived reason had fled.

In this patient the severe nervous strain, which in others would have led to irritability, exacerbation of local or general symptoms, resulted in a return of the melancholia, which heretofore had appeared only in response to the morbid uterine stimulus when intensified by the menstrual congestion. The force of the uterine irritation had been allayed by improvement in the existing morbid condition, so that it proved powerless to evolve a response even under the heightened pressure of the menstrual excitement; but the tension of the nervous system, strained to the utmost, was such that it proved unable to resist the influence of even the greatly diminished local irritation: before, it had been the stronger pressure upon the trigger which caused the explosion, now it was the weakening of the spring which forced it to yield to but trifling pressure. Believing that under favorable conditions no relapse would occur, I urged her immediate return home, as the cause of her trouble was evidently home-sickness: her condition was one of melan-

cholia tending to mania; unconscious of her surroundings, her eyes unsteady, without the light of reason, she recognized no one but her husband, for whom she constantly called, and whose momentary absence caused a wild despair. My diagnosis was verified; upon his coming and the promise of a speedy journey homeward she at once became quiet, and within a few days reason returned. Her health has been greatly improved; she no longer complains of pelvic pains, and several periods have passed without either local or reflex symptoms, with a mind clear and unruffled.

Case VIII. *Violent Epileptiform Attacks during Pregnancy relieved by Cauterization of the Eroded Cervix.*[1]—Mrs. O——, aged 28, menstruated at the age of fifteen, married at twenty-four, has always been healthy; gave evidence of no hereditary taint; menstruation, perfectly normal before and after marriage, is never painful; has had one miscarriage, in the sixth week, soon after marriage; has since borne two children, the youngest of which is eighteen months old. A few weeks after the last confinement she first complained of that heaviness of the head with dizziness and languor from which she has suffered ever since, together with epileptiform attacks, which appeared at about the same time; at first in a very mild form, once or twice a month, as an oppression of the chest and a shortness of breath, which would pass away in the course of five or ten minutes. These attacks rapidly increased in frequency and in severity, always beginning in the same way, with a shortness of breath, with an oppression of the chest, a feeling of constriction; then twitching of the fingers with spasmodic closing of the hands, and she becomes unconscious; convulsive motions of the arms and opisthotonos follow. This is sometimes so intense that the heels almost touch the head, and the contraction of the dorsal muscles has been so sudden and so violent that the patient has hurled herself from the middle of the bed upon the floor by a single effort. During the attack, which lasts from ten to fifteen minutes, she is totally unconscious, the eyes closed, hands not firmly clenched, thumbs not turned in; then a state of relaxation follows. During the last month she was confined to her bed the attacks were severe and quite frequent, and her condition grew constantly more unbearable, notwithstanding the liberal use of chloral and bromide of potassium, which was properly prescribed by the physician in attendance. As the patient did not improve, Dr. H. Greiner was called in. He pursued a similar course of treatment, adding opium injections: by an oversight on the part of an attendant a teaspoonful of the strong tincture of opium was administered internally, but even this did not check the attacks, which appeared three or four times a day, continuing with great intensity from ten to fifteen minutes at a time.

[1] "An Hystero-psychosis," *St. Louis Clinical Record*, 1878.

March 18, 1878, I first saw Mrs. O—— in consultation with Dr. Greiner. We had hardly entered the room when her hands began to twitch nervously, her eyes closed, her head was plunged backward and buried in the bedding in violent opisthotonos. The spasm yielded for a moment, to return with increased severity, with violent contractions of the dorsal muscles, hurling the patient from one side to the other, so that she was with difficulty held down by the combined efforts of those about. After the attack, which had lasted twelve minutes, a stupor supervened. Her husband was constantly by her side, as in these convulsive contractions, by which she was bent almost into a circle, she was in danger at any moment of hurling herself from the bed, as if thrown from a spring-board, and it was only possible for her husband to prevent injury by holding her in his arms until the muscles relaxed, catching her as she bounded upward, head and heels almost in contact. Upon recovering she complained of dorsal and hypogastric pains and heaviness of the head, which had persisted for weeks with occasional nausea and vomiting, more particularly in the morning; the conjunctiva was slightly injected, the pupils normal, their reaction perfect, but slow; she had a dull, stupid look and was slow in her answers. The uterus was enlarged, the cervix lacerated, eroded, and congested, the erosion sensitive; one period had been missed. The eroded cervix was thoroughly cauterized with nitric acid and a glycerin cotton tampon with tannic acid was introduced into the vagina.

With the exception of a slight spasm on the evening of the 18th, the epileptiform attacks did not recur from the time of the application of the nitric acid until the 22d, notwithstanding the discontinuance of all sedatives. On the 24th the patient had a severe attack, for which Dr. Greiner was obliged to resort to chloroform: this was the last, but nausea and vomiting steadily increased, until on the 26th they had become most distressing; but these I looked upon as reflexes of pregnancy. A sponge tent was introduced in order to favor the expulsion of the ovum, which occurred on the 31st. I did not see the patient until two days later, and found her remarkably changed: her complexion was better; she had lost her pale, bleached appearance and distressed look; the vomiting had ceased with the dilatation of the canal and the expulsion of the ovum, and the epileptiform attacks had yielded instantaneously to the cauterization of the cervix, returning but once in a severe attack on the 24th. Two weeks after the miscarriage Mrs. O—— was attending to the lighter duties of the household, feeling more vigorous and more cheerful than she had at any time since the birth of her last child, to which the laceration and erosion are referable. In this case we have an hystero-epilepsy proper, in a most aggravated form, of sixteen months' duration, checked by a single application of nitric acid to the eroded cervix, and cured by the second. Coexisting are the nausea

and vomiting—the reflex gastero-neurosis of pregnancy—which yielded only to the dilatation of the canal, and was in no way affected by the cauterization which overcame the psychosis, the latter evidently referable to the erosion of the cervix, the former to the congestion of the muscular tissue or lining membrane.

Two years later I saw this patient under precisely similar circumstances, with the same terrible epileptiform attacks, but, though the symptoms abated after the same cervical application, they were in this second case not overcome until the canal had been dilated by the sponge tent, and complete recovery did not take place until after the expulsion of the ovum, proving the psychosis, which before had been referable to a morbid condition, the erosion of the cervix, in this instance to have been clearly dependent upon the pregnant state.

Case IX. *Recurring Puerperal Melancholia.*—Mrs. X——, wife of a confrère, a healthy matron of 29, happy in all her surroundings, free from all evidence of pelvic disease, began to show symptoms of mental aberration in the second week of her first confinement: a local cause was sought for and remnants of placental tissue removed, yet no change took place. Constitutional treatment proved ineffective; local applications were not possible, on account of the condition of the patient, and not permitted by her; a deep melancholia, varied at times with maniacal attacks, followed, and not until involution had been completed did any improvement take place. With the restoration of a normal condition of the reproductive organs the mental faculties returned, and the patient continued in the best of health, robust in body, cheerful in mind.

Three years after this period conception again occurred: pregnancy was marred by no unfavorable symptoms, and labor progressed favorably; a healthy child was born, but within a few days a return of the same symptoms was threatened, and for two months the patient was guarded with the utmost care; no explosion occurred, yet she was constantly upon the verge of mental alienation, and not until involution had taken place did a healthy state return.

The case is an exceptionally well-defined example of a recurrent physiological reflex, the psychosis appearing during the puerperium independent of pathological conditions, and continuing throughout the entire period, notwithstanding all that the love of a devoted husband and the care of expert physicians and watchful nurses could do, and recurring with the return of similar physiological conditions, in a healthy body, with a healthy mind and healthy reproductive organs, notwithstanding the precautions taken to avert the expected and greatly dreaded condition.

Case X. *Recurring Physiological Hystero-psychosis: Melancholia with Maniacal Attacks accompanying Puberty and the Menopause.*—Mrs.

K——, a bright, sunny girl in childhood, gave way to melancholia in her sixteenth year with the advent of puberty. For some three or four months she was in a state of religious mania, shrinking from contact with the world, fearful of hurt or accident, singing psalms and begging her family to join in her religious exercises: with full development of the menstrual function a normal mental condition returned. During an active life a healthy condition of mind and body was retained, even during menstruation and pregnancy, but as the menopause approached occasional attacks of a similar nature returned, as the patient was in a state of constant mental anxiety and haunted by fear in her domestic infelicity. Her marital relations were not happy; she was in great dread of her husband, who threatened and maltreated her, and with the cessation of the menses this condition became one of mania—at times in great fear of others, always expecting an accident, fearing, if her children were out at play, "that the trees would fall upon them or that the lightning would strike them;" above all, she was in dread of being buried alive. Religious conceptions gave color to her delusions, but in the main they were governed by fear of her husband, and the cruelty of the man, aggravated by his wife's misfortune, led to bodily injury, which in her present mental state will, I fear, result in confirmed and permanent mania, whilst under more favorable circumstances, with a happy home-life, I am sure that this hystero-psychosis of cessation would have ceased as readily as did the first reflex at the time of puberty when the functional wave had died out: like the ship at sea upon which the tidal wave crushes down, she passes through the ordeal unscathed if her timbers are strong, but is wrecked if worm-eaten ribs compose her frame. This is a recurrent physiological reflex under adverse conditions, contrasting in this respect with the one previously cited.

Case XI. *A Pathological Hystero-psychosis referable to a Retroflexion of the Uterus, first appearing after marriage, checked by the placing of a pessary and by reposition of the uterus.*—I cite this striking case from the practice of Dr. J. Cheston Morris of Philadelphia, who has kindly placed the history at my disposal: Mrs. G. W. L——, aged 40, had continued in good health, free from nervous or mental disturbance, until the appearance of the first epileptic attack three weeks after marriage. These attacks, at first mild, gradually increased in severity, and were followed by nausea, headache, and intense depression, so completely overcoming the sufferer that in the agony of each attack she despaired of living through another. Patient had been treated in various ways, and most heroically, under all the various theories of epilepsy, even to losing a number of sound teeth in hopes of curing a neuralgic condition of the superior maxillary branch of the fifth pair, which at one time was supposed to be accountable for this sad condition. Her

general health was fair; no uterine symptoms had been detected; the only child was eight years of age.[1]

When seen by Dr. Morris, fifteen years after the occurrence of the first attack, he found some retroversion and a small warty growth on the posterior lip: this was excised, the base touched with nitric acid, the uterus replaced, and a Hodge pessary inserted; a careful diet was prescribed, and bromide of potassium and Plummer's pills were given. With the removal of the growth and the reposition of the uterus these attacks suddenly ceased.

As the husband had kept strict account of his wife's terrible condition, we know that in those fifteen years she has had six hundred and fifty-one of these attacks. Six months after this one treatment and cure a single slight attack appeared, but since then—and four years have passed—the patient has continued in the enjoyment of perfect health.

This striking case, which so thoroughly demonstrates the direct causative relation between the psychoses and uterine disease, is but one of many I have observed and might record, and I will but refer briefly to another:

Case XII. *Pathological Hystero-psychosis in a Virgin.*[2]—A robust, well-developed girl of 17, suffering from daily epileptiform attacks, was relieved by the cure of the causative erosion and endocervicitis. A single application of nitric acid to the cervix checked the attacks for five days, and complete relief was afforded by the cure of the endocervicitis by means of slippery-elm tents and occasional applications to the inflamed cervical mucosa. Whilst cauterization of the erosion lessened the violence of the reflex psychosis, it did not cease until the endocervicitis had been checked, and thereupon the pain disappeared, the head became clear, and the complexion improved.

Dr. Barker, in his memorable paper on "Uterine Disease as an Exciting Cause of Insanity,"[3] cites an equally characteristic case in which insanity was caused by a displacement of the uterus, and reposition of the extremely retroverted and enlarged organ was followed by immediate disappearance of the mental disturbance. To use his own words: "I found the uterus retroverted, packed down, so that it required some force to replace it. As soon as this was done she loudly ejaculated, with a kind of satisfied grunt, 'There, now!' and at once ceased spitting, became perfectly quiet, and before I left the room felt happy. On

[1] I quote the words of Dr. Morris, who himself records the opinion of the previous attendant, when he says that no uterine symptoms existed. Though no discomfort was complained of, and the patient may have been in the best of health, continued sterility after the birth of one child would lead us to suspect some serious lesion of the reproductive organs, most probably an injury of the uterus referable to the one confinement.

[2] "Case 2. The Hystero-neuroses," *Transactions American Gynecological Society*, 1878.

[3] *Journal of the Gynecological Society of Boston*, May, 1873, p. 347.

visiting her next morning I was surprised to see her sitting at the breakfast-table smiling and happy."

The above-described are true cases of hystero-epilepsy, at least what I would call so—epilepsy directly dependent upon uterine disease, a strictly genito-reflex psychosis, which is widely different from the hystero-epilepsy of Charcot and others marked by sexual hallucination, the insanity which is principally manifested by morbid cravings and sexual hallucinations and said by alienists to be pure exaltations. The insanity of old maids, though in connection with uterine or ovarian disease, has never been proven to be strictly a reflex hystero-psychosis or a hystero-epilepsy.

Case XIII. *Melancholia and Nervous Irritability, due to Laceration of the Cervix, cured by Emmet's Operation.*—Mrs. S——, from Illinois, suffering from mental and physical prostration, great nervous depression, was referred to me on account of spinal and hypogastric pains. Her symptoms were sufficiently explained by a retroversion of the enlarged uterus, laceration of the cervix and perineum, metritis, and endometritis. Local treatment was inaugurated, and the subsequent improvement of the uterine lesion was accompanied by a corresponding improvement in the general health of the patient, while the mental condition remained unchanged.

The melancholia and nervous depression being in no way affected by the decided change in the uterine inflammation, I referred the psychosis to the laceration, and decided upon an operation; at the same sitting, the patient under the anæsthetic, the endometrium was curetted and both lacerations, of the cervix and perineum, closed. The uterus was reduced in size, the vagina very much narrowed, and a strong perineum established, also a small healthy cervix; but the smaller left angle of the cervical laceration did not perfectly unite, although all parts were covered by healthy mucous membrane and no raw surface remained, so that I looked upon the object as accomplished; still, the mental condition remained unchanged, and I ascribed the imperfect result, the continuance of the mental depression, to the slight retroversion which remained.

The patient, a farmer's wife, upon whom a household and three little children depended, looked forward anxiously to perfect restoration, and remained for treatment, which was conducted with all possible care, and a perfectly healthy condition of all pelvic organs was finally attained. No change, however, was effected in the mental status, and I advised the patient to go home and continue the use of douches and tampons, giving tonics, urging a milk diet—all to no purpose. Six months thereafter she returned, entered the Polyclinic, and treatment was resumed; again to no purpose: melancholia continued; patient was languid, with a dull, heavy appearance, indifferent to everything about

her, irritable when in contact with others, so that she was disagreeable to resident physician and patients, and her treatment became an annoyance to me. Seeing no result whatsoever, I determined to resort to a second operation. Though the cervix was small and the os appeared merely like an enlarged oval, not at all unusual for a multipara, lined with perfectly healthy mucous membrane, I again pared the left side, which had not perfectly united, and closed it with three catgut sutures. From the moment of her recovery from the chloroform her disposition was changed: her eyes were bright, the persistent melancholia had disappeared, and a pleasant smile now greeted her fellow-patients in place of the irritable avoidance which they had met with before. She was soon on her feet, a comfort and help to the other patients whilst she remained in the ward.

Although complete involution had been accomplished by the first operation, the mental disposition, depression, and irritability were in nowise changed, and not until a complete closure had been effected, and an os established hardly large enough to admit the sound, was this altered; but from the very moment that this angle was united by the suture the morbid mental symptoms disappeared, characterizing the marked dependence of the psychosis upon a trifling localized lesion.

b. The Nervous System; Hystero-neuroses Proper; Genito-Reflex Nervous Disturbances.

The terminal fibres of spinal and cerebral nerves give ready evidence of uterine and ovarian disturbance: whether the impulse is conveyed through the ganglionic system or the pneumogastric, spinal and cerebral nerves respond to uterine irritation either throughout the entire body or in circumscribed areas upon any one part.

Uterine changes are reflected in the course of the spinal column, in the hypogastric and lumbar regions, on the top of the head, on the occiput, the wrists and ankles, toes, knees; in fact, upon any part of the body. Most common of all these are the spinal and hypogastric pains, together with the pain on the top of the head and in the back of the neck, so that these symptoms have become pathognomonic of uterine disease. Tilt out of his 500 patients examined during the menopause finds dorsal pains in 226 and abdominal pains in 205; in fact, so thoroughly have these pains become assimilated in the popular mind with uterine disease that the physician will find it difficult to convince a patient that she could possibly have any disturbance of the reproductive organs if the backache and hypogastric pains are wanting; and if in addition no menstrual irregularity exists, this becomes simply impossible. Whilst these symptoms may remain permanent in one patient, varying with the vacillations of the condition upon which they depend, they change most rapidly in others—so much so that they

are likened to rheumatic pains, sometimes in one place, sometimes in another, moving about constantly.

As a rule, certain pains exist in one and the same patient, and vary with the causative condition; like all other hystero-neuroses, they are usually dependent upon a pathological condition aggravated by functional congestions, menstruation or pregnancy, but may also occur at the time of physiological congestion only.

These symptoms usually appear two or three days before the menstrual flow, with the coming of the uterine and ovarian congestion, and cease upon the second or third day after the flow has stopped: during its continuance they may disappear; if the neuroses persist, continuing throughout the intermenstrual period, they are intensified during the time of physiological congestion. It is a characteristic mark of a reflex neurosis that, like uterine disease, it is aggravated by exertion, exposure to cold, and menstruation—I may add, by every physiological wave; but as certain of these symptoms disappear during the continuance of the menstrual flow, they may disappear likewise during the period of pregnancy. They are frequent and more intense during puberty and the menopause than they are during the menstrual period.

The most common and well known of these symptoms are the dorsal pains, the pains in the small of the back, either limited to that point or extending, like the pain of labor, from the spine toward the hypogastric region: this pain may also occur between the shoulder-blades. The hypogastric pain is usually upon the affected side; that is, the side of the cervical laceration, the side of greatest ovarian irritation or of peri-uterine disease: like the higher dorsal pain, it may be at the height of the shoulder-blades, but lateral. This hypogastric pain, which is a reflex neurosis, must not be confounded with the actual pain of cellulitis or the pain from localized pressure, and careful differentiation is necessary, as certain of these reflex nerve-pains closely resemble inflammatory pains and those which arise from direct pressure either upon sensitive organs or upon a nerve, as upon the sciatic, and then extending along its course down the leg. Whilst the one is superficial and diffuse, the other is deep-seated, often more clearly circumscribed, and if from nerve-pressure follows the central nerve-tract so perfectly that this can be traced by the pain as in a dissection.

A very frequent sensation is that of quivering in the abdomen, likened by some to the quivering of a mass of jelly, frequently an evidence of ovarian congestion and mistaken for movements of the child by those longing for pregnancy. The pain, burning, and pressure on the top of the head are extremely common, and the spot feels warm to the touch or is so sensitive that the comb is painful. The pain in the nape of the neck and the drawing back of the occiput, as in opisthotonos, likened by the experienced to the evidences of cerebro-spinal meningitis,

is likewise frequent: more rare is the feeling of drawing upward of the neck and back of the head. Less common, but still frequent, is the feeling of an encircling band, the symptom being referred by some to the waist, by others to the chest or head—a painful sensation of compression as by an iron band.

Pains in the ankle and in the wrist are frequent, referable, as a rule, to the side of the pelvis in which the diseased part lies from which the reflex originates. These pains may extend to or appear in the soles of the feet, the heels, or the toes: they may be so intense as to make walking impossible. In a patient afflicted with ovarian disease and bedridden I have seen the pain in the heels so intense that it was with the greatest difficulty that a comfortable position could be found for her; she was obliged to lie on her back, so that her heels must almost inevitably touch the bed in some way, and even light contact with the bedding caused agony.

These superficial pains, genito-reflex nerve-symptoms, arising from reflex irritation in localized groups of terminal nerves, may appear in any part of the body: over the heart they cause the dread of cardiac disease, with cardiac and præcordial pains; in the shoulders, in the chest, they resemble rheumatism: whilst they may exist in any part, those named are the most common and characteristic. Many a patient afflicted with uterine disease without local symptoms is sent by the unsuccessful family physician to an eminent neurologist or to a watering-place for gastric or cardiac rheumatism. Even while writing this, in a European watering-place, I meet an American lady from the Far West who has been sent abroad to prominent physicians for treatment of an unyielding gastric and muscular rheumatism; these authorities have sent her to this spa to overcome what they have diagnosed as nervousness and nervous debility: the iron waters and salt baths, which have truly regenerated her merely debilitated sister, have failed completely in her case. Naturally so: a uterine disease is evidently the cause of this reflex neurosis, which simulates the above maladies, and no spa can overcome this causative affliction. Unfortunately, she is but one of many who gradually sink into invalidism under continued treatment of the phantom disease, the genito-reflex neurosis.

Most frequent (and in the order named) are the spinal and hypogastric pains, the pains in the top of the head, back of the neck, quivering in the abdomen, pains in the wrists, ankles, and heels. The pain of coccyodynia, whilst at times referable directly to pressure or disease of the bone or surrounding membranes, is liable to be a reflex neurosis, a concentration of spinal pains in the terminal bone.

So common and so well known are the dependence and fluctuation of these pains upon the improvement or exacerbation of local conditions that I need but briefly mention a few striking cases.

Case XIV. *Pathological Genito-reflex Neurosis; Intense Spinal Pains due to Laceration of the Cervix; Complete disappearance immediately after Operation.*—Mrs. X——, from Mississippi, a beautiful octoroon, was completely debilitated by the intense backache from which she had suffered since the birth of a child some three years previously. She had been constantly under treatment, local and general, without relief: applications of all kinds had been tried—blisters, cautery to the spine, the usual remedies to the uterus and cervix—with but temporary improvement at times. Relief was but rarely afforded, and then for a short time only.

Emmet's operation was performed, but no anæsthetic given, as the patient preferred to do without. Before she was removed from the table, from the moment the sutures had been united, the pain ceased: with slight assistance she walked to her bed, happy in the complete relief afforded. During convalescence she was free from all pain and felt perfectly comfortable. Upon the eighth day the sutures were removed: only partial union had taken place, and from the time of the removal of the sutures, as the surfaces fell apart, her backache returned. After the cessation of the next menstrual period a second operation was performed with precisely the same result: the backache ceased as soon as the parts were firmly united. I was unfortunately obliged to perform the operation under the most unfavorable surroundings, in a filthy hospital, and I am unable to speak of the final result, as the patient was carried away by septic poison. I cite the case, however, to show the dependence of this spinal pain upon a local cause—in this instance the laceration—and not, as is usually supposed to be the case, upon uterine displacement, traction upon ligaments, or pressure of the enlarged fundus upon the spinal column.

Case XV. *Pathological Genito-reflex Neurosis; Relief by a Single Well-placed Tampon.*—Mrs. X——, from East St. Louis, suffering with a variety of reflex neuroses, insomnia, pain in the region of the heart and below the liver especially violent, so that cardiac and hepatic disease were supposed by the patient to exist, notwithstanding all I could say and the assurance to the contrary of the various specialists consulted. Repeated examinations of heart and liver revealed a healthy condition of those organs. The patient was afflicted with the usual concomitants of lacerations of the cervix and perineum—endometritis, uterine enlargement, retroversion, and, later, perimetritis. Many of the symptoms were relieved and her general health was greatly improved by operation on the cervix and perineum, but the neurotic pains, insomnia, and pains in the region of the heart and liver remained; hence treatment was again resorted to: great relief was afforded by utero-abdominal faradization. Reposition of the uterus was attempted by an

elastic tampon; still, though improved at times, the above-mentioned pains persisted.

The patient was under constant care in the gynecological department of the Polyclinic, and the routine treatment was continued; coming by accident on an off day, she was attended by a member of the staff hitherto unfamiliar with her case, Dr. T. E. Holland, who forced a reposition of the retroverted uterus much more violently than had been before attempted, causing the patient great pain. Two days later she returned completely relieved; she had suffered very much from the treatment and experienced a feeling, as she expressed it, of something giving way, but from that moment the annoying pain ceased and she slept soundly throughout the night: the persistent and annoying insomnia had vanished. Notwithstanding the pain locally caused by the tampon, the effect was a most happy one: the distressing mental and nervous condition of the patient yielded at once and gave way to perfect well-being.

Case XVI. *Reflex Neurosis dependent upon Uterine Disease relieved by Uterine Galvanism, by Sedative Applications to the Irritated Uterine Terminals.*—Mrs. H——, suffering from a laceration of the cervix, with the consequent train of symptoms—endometritis, retroversion of the enlarged uterus, a congested and everted cervix—was afflicted with a series of violent reflex phenomena—dyspeptic symptoms, palpitations of the heart, dyspnœa, spinal pains, hypogastric pains, with a most annoying quivering in the abdomen, headache, and insomnia. Emmet's operation was proposed, but preparatory to this I advised treatment for the purpose of overcoming the more violent inflammatory symptoms, especially the endometritis. As treatment progressed her general condition improved, but the reflex symptoms were not alleviated. I had once resorted to electro-cauterization of the uterus with no more than slight improvement. Two days later I determined upon an electro-puncture, inserting a platinum needle, in connection with the negative pole, to the depth of one inch in the engorged cervical tissue, the positive dispersing plate being placed upon the abdomen: a current of 100 milliampères was passed for three minutes, and before the expiration of the sitting the patient gave a sigh of relief and expressed her complete well-being. As she stepped off the table her motions were free, and when she returned three days later she informed me that she was perfectly well; her appetite was excellent; sleep perfect: the dyspnœa had disappeared; she had taken long walks, and was no longer troubled by the reflex neuroses—pain in the back and sides and abdominal quivering.

This is one of those cases of a reflex neurosis relieved by the sedative action of the remedy upon the irritated uterine nerve-terminals, and not by improvement in the uterine disease, as the symptoms had persisted

notwithstanding the change for the better in the local lesion, but disappeared at once apparently by the action of the electric current accidentally directed immediately to the suffering nerve.

Case XVII. *Continuance of Genito-reflex Hystero-neurosis after Complete Extirpation of Uterus and Ovaries, cured by the Sedative Action of Galvanism on the Irritated Nerve-tracts.*—Mrs. K—— had been subjected to the extirpation of uterus and ovaries on account of a uterine sarcoma which was causing a rapid failing in health. After the operation, from which she rapidly recovered, her general condition improved greatly: she gained in flesh and general appearance, and lost the cachectic look which had previously existed. The burning pain in the top of the head which had annoyed her so much disappeared for a time after the operation, but soon returned, greatly increased in intensity, and with it appeared that pain in the ankles, shoulders, and soles of the feet which is characteristic of uterine and ovarian disease. These symptoms were so annoying that, after persistent treatment by the physician who had operated so successfully, she was referred as an incurable neurotic to Professor Hermann of the Department of Nervous Diseases (St. Louis Polyclinic).

When this patient came under Prof. Hermann's care she was hardly able to walk, so intense was the pain in feet and ankles on both sides. He treated this as a nervous disease, as he did the pain in the top of the head, affording relief by each application of electricity to the afflicted part; she was rendered more comfortable, better able to walk, but it became necessary to repeat the treatment, as the relief afforded was but temporary. Entering the clinic-room by accident whilst this patient was under treatment, Professor Hermann related her symptoms to me, and I at once urged that the case be turned over to the gynecological clinic, as it was evidently one of uterine disease. I was not a little astonished to hear that uterus and ovaries had been removed, yet urged the treatment of the patient upon the supposition of an irritation of the uterine terminals. She was accordingly referred to the gynecological department, and treatment inaugurated as for a reflex neurosis arising from pelvic disease: vagino-abdominal galvanism was applied, the negative vaginal electrode to the cul-de-sac, the positive abdominal plate directly over this upon the abdominal walls. After the first application greater relief was experienced than had ever been obtained by direct treatment of the affected parts; pains in both head and feet were greatly improved, and after the third treatment they practically disappeared, to return, however, after an interval of time. The patient came but a few times after this, and I have seen nothing more of her; whether relieved or not by the treatment I cannot say; certain it is that the pains in head and heels were relieved more rapidly and more completely by the application to the uterine tracts than to the site of pain.

I have cited this case in evidence of the fact that reflex neuroses may be induced by a continuance of the irritation in a nerve-fibre even after the causative terminal is removed: the impulse emanated from the stump of the uterine fibre at its point of amputation, precisely as it had from the terminal before its removal. Precisely as a pain of former years is often felt in a foot long after amputation of the leg—which must be referred to morbid action in the nerve at the point of amputation—so did this uterine fibre determine a reflex action as if the causative terminal was still under the influence of morbid action. The result is at the same time an evidence of the possibility of affording relief in case of reflex neuroses by sedative action upon the affected nerve-terminals, though the morbid condition which causes the impulse may continue.

II. The Circulation.

The circulatory system throughout the entire body is under the direct control of the vaso-motor nerves, which follow its innumerable ramifications from the cardiac centre to its capillary meshes. By reason of the direct connection of the ganglionic fibres with the vaso-motor nerves, these readily respond to changes, morbid or physiological, which may take place in the vital centres. No system gives evidence of these reflex impressions more rapidly or more vividly than the circulatory: in response to peripheral stimulus we see the hot flush of the dilated capillaries or the cold pallor of the contracted vessels which mark the undulation in the vaso-motor fibres—on the one hand paralysis, increased tension on the other. All nerve-action finds a ready reflex in the vaso-motor system, so much so that we involuntarily regard this as an index of the emotions and the secret workings of the mind. Hardly less than the changes in the great cerebral centre are the waves emanating from the reproductive organs delineated by these sensitive fibres. Hippocrates has already called attention to shivering and an unusual development of heat as a sign of pregnancy—symptoms of a purely reflex nature, and not in any way referable to the increased vascular development accompanying the physiological hypertrophy.

So intimate and so intricate is the relation existing between the vaso-motor nerves, uterus and ovaries, and the central nervous system that it is not always easy to trace the existing relation and to determine cause and effect: a peripheral congestion or hemorrhage may be a simple concomitant or a natural result of pelvic congestion, or it may be a reflex symptom. The circulatory system may respond to uterine or ovarian irritation in its entirety or in any one of its parts, as it is governed throughout by the accompanying fibres and ganglia, which control its every action as truly and as promptly as a steam-valve does the workings of the engine; hence genital irritation may be character-

ized by symptoms on the part of the heart or portions of the peripheral system, especially superficial capillaries upon the skin; or this reflex may be general throughout the entire peripheral system, made evident by a chill or fever; or, as is more usually the case, it is localized, and recognized by the coldness of hands or feet or by the flushes of the face. Coldness of extremities is a frequent symptom of uterine disease; palpitations of the heart, irregularity of the heart's action, usually intermittent, accompany morbid conditions. Ovarian disease is often marked by flushes—by the hot flushes of the face which we frequently find at the change of life, where it may, however, be dependent upon irregularity of the circulation. These symptoms, so varying in their nature—all, however, the result of contraction or relaxation of portions of the vascular system in response to morbid stimulus carried from uterus and ovaries to the vaso-motor nerves through the ganglionic system—may be classified as,

1. Cardiac or central; and
2. Vascular or peripheral.

1. *Cardiac or Central Circulatory Reflexes.*—As the heart's action varies with the emotions and the state of mind, so it responds to a variety of uterine or ovarian states, both physiological and pathological. I will not enter upon the difficult differential diagnosis between physiological hyperactivity and the reflexes of pregnancy, as observation alone can determine the origin of symptoms referable in part to one, in part to the other cause, and I shall speak only of the true or pathological reflexes, as the same phenomena may exist as menstrual neuroses and neuroses of puberty and the menopause.

(*a*) *Palpitations of the Heart.*—This is among the most common of the hystero-neuroses, as it is the most frequent response to emotional impulse; but not until this violent beating of the heart has been proven to be a uterine reflex by cessation upon uterine treatment can its origin be definitely determined, as the same symptom is referable to so many other causes.

(*b*) *Rapidity of the Heart's Action*, frequently accompanied by intermission, I have repeatedly observed as a symptom of uterine disease annoying the operator, who may be in doubt as to the propriety of using anæsthesia until he has fully solved the question of cardiac disease.

The direct dependence of cardiac action upon ovarian changes is strikingly evident in the sudden slowing of the heart-beat upon constriction of the ovarian nerve. So striking is this symptom that repeatedly has the careful assistant, while giving the anæsthetic for me, called a halt and inaugurated resuscitation as the pulse fell from 80 to 34 at the moment of ligating the ovarian pedicle. My attention being thus called to the matter, I have observed the same reaction in almost

every instance, and have assured myself of the direct dependence of the heart's action upon the ovarian impulse by the loosening of the ligature, in response to which the beat at once returned to the previous frequency. Dr. Hodgen, our lamented surgeon, informed me that he had observed the same phenomenon in ligating the spermatic vessels before removal of the testicles. Whilst a very rapid beat of the heart, 120 to 130 in the minute, may accompany uterine and ovarian disease, this is often varied by an intermission more or less regular, sometimes one in six or eight, even in three or four; and again it may be observed repeatedly in rapid succession, and not again for minutes.

(*c*) *Pains in the Heart*, such as may simulate an endocarditis, are frequently complained of by women suffering from uterine disease or when in a state of functional change during menstruation and at the change of life. Occasionally it is præcordial, more like a rheumatic pain, or it may appear as a feeling of compression, as if by an iron band, which is spoken of.

These symptoms, violent palpitations or irregularity of the heart's action and pains in the cardiac region, so nearly simulate heart disease that a careful examination may be necessary before the giving of an anæsthetic; and so deceptive are they that I have repeatedly sent the sufferer to a specialist for examination, notwithstanding that, as in other neuroses, we have a reasonable assurance of the reflex nature of the symptom by its exacerbation at the menstrual period or upon a slight cold or exertion, such as would aggravate the existing uterine symptoms; and upon this I would lay perhaps greater stress than upon the negative evidence of auscultation and percussion, which assure us only of the absence of disease.

The cardiac reflexes of pregnancy are more obscure, as actual circulatory changes exist at the time, and it impossible to demonstrate their true nature by removal of the cause; hence I have not touched upon these, and have cited only such as have been clearly proven to be reflex in their nature by their prompt cessation upon the cessation of the cause of the trouble.

The cardiac neuroses, more than those of other organs, have of late received attention on the part of careful observers. They are symptoms of extreme importance from a practical and diagnostic point of view. I need only refer to the results of an erroneous diagnosis in the case of a patient seeking insurance: she is disbarred from all its advantages on account of a slight, possibly unnoticed, uterine disease which produces the deceptive vaso-motor reflex. If the neurosis is mistaken for the disease proper, her family are deprived of the benefits of life insurance.

Although the phantom is distinct from the disease, its reflex nature is by no means practically appreciated, as it should be even by those

who have given attention to the subject. One of the most instructive articles is the chapter on neuroses of the heart[1] in *Pepper's System of Medicine*, volume iii. p. 750, in which the symptoms are clearly outlined, but their treatment as a reflex disease hardly demonstrated with sufficient emphasis: the cardiac neuroses are here considered as a whole, from whatever source they may originate.

The cardiac hystero-neuroses have also been well described by H. J. Boldt, M. D., in a paper on "Cardiac Neuroses in Connection with Ovarian and Uterine Disease," read before the New York Academy of Medicine,[2] who prefers the term "reflex cardiac disturbance" for those fluctuations which present symptoms similar to those attended with organic lesions, deeming the term "neurosis" faulty, as these troubles are either of reflex origin or arise in the cardiac ganglia. Boldt believes these functional affections of the heart, unaccompanied by inflammatory changes, to appear as reflex symptoms in 8 per cent. of all uterine diseases, and divides them into four classes: 1, palpitation; 2, disturbance of rhythm (irregularity); 3, suspension of one distinct beat (intermittency); 4, angina pectoris. Class 1 is the most frequent neurosis, being caused by the emotions; Class 2 is caused by a modification of the rhythmic discharge in the cardiac ganglia; it may be congenital or the result of emotion, as passion, grief, joy. Angina pectoris, the most painful of all the neuroses, so closely resembles the symptoms of organic lesion that only an examination of the heart during the attack would exclude this: the pain is often felt radiating down the left shoulder, arm, and hand, in which formication is at times observed. These attacks are intermittent, the patient being entirely free in the interval: the heart's action is at times feeble, at times irregular, and painful spots are found over the region of the heart. The functional disturbance, he correctly says, may be cured by attention to the pelvic disease, but in chronic cases attention to the pelvic disorder alone will not suffice, systemic treatment being necessary. This is more or less true of all hystero-neuroses, yet some become more firmly established than others: those of the eye are the most persistent, as we have seen. While in their early stages the cardiac neuroses respond readily to changes in the uterine condition, at a later stage, when the molecular disturbance in the contracting nerve-fibrils is long continued, it will persist after removal of the causative stimulus. Though constitutional medication may assist in treatment, and is always desirable in chronic cases, this alone should not be relied on if a cure is to be achieved.

2. *Vascular or Peripheral Circulatory Neuroses.*—These may be general or local, referable to the entire system, like the fever, or limited to

[1] "Functional Diseases of the Heart's Action, Angina Pectoris, and Exophthalmic Goitre," by Austin Flint.

[2] *American Journal of Obstetrics.*

a circumscribed region, internal or external; upon the extremities, cold feet; on the face, a flush; upon the mucous membrane of throat or lungs, a laryngitis or an asthma.

(*a*) *General Peripheral Neuroses.*—The most marked of these are chills and fevers, which can be unquestionably referred to changes in the reproductive organs. The chlorosis which is often observed at the change of life and in connection with uterine disease has been considered by some as a circulatory disturbance attending the ovarian nisus, and it has been explained as a resultant of the ovarian impulse in an already ill-balanced circulation. As I have myself not satisfactorily demonstrated the direct causative relations, I am unable to assert the positive reflex nature of chlorosis. The chills, known to the sufferer herself as nervous chills, are more readily referable to local changes; but most characteristic and most deceptive are the fevers, with or without elevation of pulse, apparently a partial paralysis of the entire vasomotor system.

This peculiar peripheral hystero-neurosis of the circulatory system appears either as a resultant of some exacerbation of the morbid uterine stimulus, now and then after undue exertion or other cause of aggravation, or as an accompaniment of the physiological wave with the intensity and with the regularity of a malarial attack. It was the occurrence of these reflex fevers that called my attention to the peculiar periodicity in certain of the symptoms of uterine disease; and I have described them more fully in a paper read before the gynecological section of the Eighth International Congress.[1] The fever comes with a certain intensity of the uterine irritation, and subsides whenever the morbid stimulus sinks below the given point; thus in some patients the fever occurs only after unusual irritation and aggravation of the uterine disease; in others it is constant, and subsides only when every precaution is taken and every, even the ordinary, irritation is removed. I have occasionally seen patients with a constant slight heat, called fever, which ceased and yielded to a normal temperature only upon rest in bed: whenever the friction of the eroded cervix against the vaginal walls was prevented by a recumbent position the fever ceased; walking would aggravate it. Those symptoms which come with a daily periodicity and monthly recurrence, coming like a malarial attack daily at a certain hour at a certain time of the menstrual period, seem to be confined to the malarial regions, such as the Mississippi Valley. That this periodicity is not an exciting febrile reaction or in any way referable to malarial origin has been proven by the absolute inertness of antiperiodic remedies and the positive correspondence of the vacillation with the uterine symptoms. The fact that these symptoms have been

[1] "The Periodicity of Symptoms of Uterine Disease," by George J. Engelmann, *Transactions of Section of Obstetrics of the Eighth International Congress.*

but rarely if ever observed elsewhere necessitates the conclusion that this periodicity is referable to intercurrent malarial influence; but it can be only the periodicity of nerve-action so influenced, as the typical recurrence is the only point of resemblance.

The symptoms in which I have observed this periodicity are fever, pelvic pain, nerve-pain, and discharge; fever and pelvic pain are the most frequent. Most striking in our malarial region is the appearance of high intermittent fever of strictly miasmatic type, which is not influenced by quinine, and is unquestionably dependent upon uterine disease, as proven by the disappearance of the fever with the improvement in the condition of the womb. Cause and effect are made evident by the failure of antiperiodic medication and the success of local treatment without accompanying medication, the disappearance of periodic symptoms with the restoration of the diseased uterus to its normal and healthy state.

Case XVIII. *Intermittent Fever toward the Close of the Intermenstrual Period.*—Mrs. S——, from Illinois, æt. 32, in good circumstances, the mother of four children, had been suffering more or less since the birth of her youngest child, five years ago, from debility, nervous prostration, backache, and pelvic pains; her condition was such that she was under constant treatment, yet no signs of improvement appeared; on the contrary, her condition grew slowly worse, so that she was unable to attend to her household duties, and came to St. Louis to consult me.

I found the uterus anteflexed, indurated, and enlarged in consequence of the existing subinvolution, with a catarrhal condition of the mucosa of cervix and fundus, and the latter hypertrophied. In addition to the symptoms already mentioned, the patient suffered, at the close of each intermenstrual period, from an intense and debilitating intermittent fever: this fever, with acceleration of pulse and rise of temperature, appeared upon the fifth day before the coming of the menstrual flow at eleven o'clock in the morning, reaching its acme at one, continuing during the afternoon, and passing away in the evening; it thus returned day after day until the coming of the menstrual flow. For several years this intermittent, apparently malarial, fever had recurred before each menstrual period, and from the time of its first appearance her attendant (her uncle), one of the ablest and most respected physicians in that section of the State, thoroughly conversant with malaria and all its varied forms, had in vain attempted to subdue it until he had exhausted antiperiodic medication. Quinine had been given until the stomach was affected and the patient rebelled against its continuance.

This was the first case of the kind I had observed, and when the fever came on, so thoroughly identical with a malarial fever in all its symptoms—the inaugural chilly sensation, the pains in back and loins

radiating downward into the thighs, especially the bilious tinge of the face—I did not doubt its miasmatic origin, and concluded to treat it as such, much to the horror and disgust of the patient, a very sensible and observing lady, who assured me over and over again that these fevers had invariably taken the same course and disappeared with the coming of the flow, whether she had taken quinine or not, and that she even felt worse when medication was attempted, as the frequent use of quinine had made it obnoxious to her.

Nevertheless, believing the previous treatment to have been inefficient, I gave eight grains of calomel, which I followed with thirty of quinine, repeating the quinine before each attack of fever. I failed completely to change its course.

I then suspended all medication and allowed the next period to pass without medication of any kind: the fever returned as usual, but was no more severe than with the use of quinine.

As treatment progressed the severity of the fever diminished, and ceased altogether after I dilated and curetted the uterine cavity. Some months later I dismissed the patient, who returned to her home and her household duties in the full enjoyment of health. This occurred ten years ago, and, although Mrs. S—— has now and then suffered from slight intercurrent diseases, the premenstrual intermittent fever has never returned.

Case XIX. *Intermittent Fever in the Middle of the Intermenstrual Period.*—Miss A——, æt. 19, a well-developed brunette, in the most comfortable circumstances (the patients to whom I here refer come from the higher walks of life), who had but recently left school, where she had over-exerted herself like so many American girls, suffered from neurasthenia, indifference, prostration, backache, pain in the head. Her home is in a beautiful and healthy portion of Missouri, yet for almost a year she suffered, in the middle of each intermenstrual period, from a severe intermittent fever which recurred upon three successive days. Every possible attention was bestowed upon this only daughter by anxious parents: she had been under the treatment of the best physicians, especially one able practitioner, a near relative, yet neither medical skill nor change of climate accomplished any perceptible change in her condition.

When she was placed under my care I discovered an enlarged, slightly movable retroflexed uterus with marked endocervicitis, accompanied by the symptoms usually characteristic of such disease, the only peculiar and unusual feature being the attack of intermittent fever, which invariably came on the eleventh, twelfth, and thirteenth day after the cessation of the monthly flow, in the middle of the intermenstrual period. The attending physician, supposing it to be malarial, had never failed to give quinine, and repeated his medication, which had

been varied in every possible manner each month, because it was supposed, notwithstanding the regularity of its return, that the progress and the continuance of the fever were at least checked by the antiperiodic treatment. Quinine was taken again and again, though the system began to revolt, as the recurrence of these burning fevers told severely on the delicate sufferer.

I had but inaugurated local treatment when the period of these dreaded fevers approached, and I well knew that it would return, as the disease was not yet sufficiently under control; but experience had also taught me the utter inefficiency of quinine or medication of any kind (nervines relieve the condition somewhat and make it more bearable).

I explained this to patient and friends, prepared them for the coming of the fever, but at the same time assured them that it would cease at the usual time without medication, and probably never again return. The attack came at the usual time, at ten o'clock on the evening of the eleventh day after the cessation of the menstrual flow, and continued during the night; upon my visit next morning she was entirely free from fever, but in the evening it returned as usual; dreading its continuance, the patient's mother anxiously demanded the giving of quinine, but finally desisted upon my assuring her of the futility of the remedy. During the night of the third attack, on the thirteenth day of the intermenstrual period, I was sent for, that I might assure myself of the intensity of the fever, and in hopes that I would then be induced to give quinine. The patient was certainly in a desperate condition—almost delirious, face flushed, hot, eyes congested, skin dry and hot, throat and lips parched—and her mother naturally dreaded a repetition, and again urged the giving of quinine, threatening to give it herself, in the firm belief that it was the use of this remedy only which had cut short all former attacks on the third day. It was with difficulty that I succeeded in urging her to refrain from its use. The fever disappeared as usual, without the use of quinine, after the third attack, just as it did when large doses had been given, and one month later, when local treatment had sufficiently progressed and the condition of the uterus had improved, the flexion and endocervicitis had been relieved, no fever appeared, to the great relief of every one, and the much-dreaded period was passed with perfect comfort. All other symptoms steadily improved, and the fever has not since returned, time sufficient, four years, having now elapsed.

(b) Localized Genito-reflex Vascular Neuroses.—Among the peripheral vascular reflexes which are localized, we find most commonly the flushes, rush of blood to the face and head, the burning in the top of the head, the burning of the side, more rarely heat in the extremities; a red nose; cold hands or feet, dry or clammy; blotches like an erythema

upon different parts of the body, even ecchymosis; sweats, hypersecretions, and bleeding, which upon the mucous membrane may be compared to the erythema and the ecchymosis upon the skin. Certain of these symptoms, such as acne rosacea and lichen, I shall discuss under the dermatoses. Tilt in his analysis of 500 patients examined during the menopause has observed the flushes in 287; perspiration in 201; sweats in 89; burning of legs and feet in 2; hot hands in 3. The flushes apparently so frequent at the time of the menopause are by no means equally common as a reflex of pelvic disease, but all the more noticeable as the flushes contrast so strikingly with the usual sallowness which marks these conditions. The reflex nature of these phenomena can often be demonstrated at will with the certainty of a chemical test; as, for instance, in a lady under treatment for the last few days, during which short time the burning in the top of the head, like the general fever, has somewhat diminished, but at all times it can be stopped in a moment by perfect quiet and a recumbent position in bed, by which the causative uterine irritation is removed.

Case XX. *Genito-reflex Peripheral Neuroses; Paralysis of Vasomotor Nerves; Flushed Appearance, especially marked on face and neck; Small Uterine Fibroma, Metritis, Endometritis, and Oöphoritis; Disappearance upon improvement before complete cure of the local disease.*—Mrs. M——, aged 36, married eighteen years; sterile; stout and of a deceptively healthy appearance, strong constitution; a sufferer since the time of her marriage from chronic uterine and ovarian disease. Patient has been under treatment during the entire period of her suffering. When first seen by me in October, 1885, she was completely prostrated, suffering from various reflex symptoms, the pelvic disease in no way marked by local symptoms. The intense cerebral pain and insomnia, which led almost to mental aberration, were the symptoms which called for relief. While the face and greater part of the upper extremities were suffused with an almost constant flush, the feet were icy cold, and she complained of a feeling of internal chilliness—as she expressed it, "as if all the blood had centred in her face and head, leaving her inner organs icy." Persistent treatment directed especially to the ovarian congestion and the stenosis and hyperplasia of the uterus caused the reflex symptoms to lessen and a healthy cutaneous circulation was re-established; coldness of the feet was improved, and the flush disappeared from the face, and even excitement caused but a temporary and slight reappearance.

In January, 1887, I was summoned to the residence of Mrs. M——, whom I had not seen for the past six months, and whose condition had been bearable during this time. Physical exertion and mental excitement had caused an aggravation of her trouble, especially an exacerbation of the nervous symptoms and aggravation of the insomnia, and the

cerebral pains of the menstrual period amounted almost to mental aberration. The flush had returned. I may here remark that before its entire disappearance, with decided improvement of the local condition, a temporary lessening of the symptoms had always followed slight dilatation of the narrowed canal with slippery-elm tents. The conditions not being favorable to treatment at home, I referred the patient to a European colleague, and have not heard from her since.[1]

This constant flush, so painful, especially to a lady having already a full healthy face, is still less disagreeable than a facial flush more limited in extent, as it sometimes occurs; for instance, upon the nose.

This paralysis of the vaso-motor nerves may be confined to isolated ramifications, and then appears as an erythema—small blotches, perhaps of the size of a quarter or a half dollar, on face, chest, or back. Usually, this is an accompaniment of the menstrual congestion or of an exacerbation of uterine disease, rarely a permanent neurosis. So also are the ecchymoses, which are usually of similar size, less frequently only the size of a pea. In those cases in which I have observed them they occurred as the accompaniment of uterine and ovarian disease of long standing, and in one instance as a neurosis of puberty.

The tumefactions which sometimes occur are similar in size and distribution, perhaps of the size of half a walnut, usually the evidence of menstrual exacerbation of uterine disease.

The burning in the top of the head is so frequent that it has come to be a most acceptable evidence of uterine and ovarian disease; but this reflex paralysis of the vaso-motor nerves, which is made evident not only by the sensation of heat to the patient, but by the feeling of heat to the examining hand, must not be confounded with the pain in the top of the head, which is distinctly a nervous reflex (a peripheral nerve-reflex).

Cold hands and feet are likewise common genito-reflex vaso-motor symptoms, and not by any means, as is generally supposed, the result of impaired nutrition, anæmia, and long-existing disease: that they exist most frequently as a direct reflex is proven by improvement upon treatment of the causative disease, or aggravation with exacerbation of uterine disease upon exertion or cold or with the coming of the menstrual congestion.

[1] I regret the necessity of adding that the lady, so far, has not been benefited: much that would have been advantageous has been more than counterbalanced by the peculiar course pursued. Several of the physicians abroad who had been consulted evidently looked upon the full-flushed face as the result of over-indulgence in spirits, and placed her upon the Oertel diet and walking cure. The puffed, flushed face of this peculiar reflex vaso-motor disturbance is indeed a curse to those so afflicted: to this patient it has been a great detriment, as it has deceived even the authorities consulted, and has led to a line of treatment most detrimental to the causative pelvic disease; hence the reflex also is now growing worse.

Perspirations, local and general, more commonly local, are occasionally met with; at times, like other of the vascular reflexes, upon that side of the body upon which we find the causative disease—upon the left side if the laceration of the cervix, the diseased ovary, or a certain uterine inflammation be upon that side. The bleeding from the navel, from the eyes, nose, mouth, is rarely found, but does occur as a reflex symptom, not to be confounded with a vicarious menstruation or a localized peripheral congestion which is the result of an impeded flow from the uterus.

CASE XXI. *Genito-reflex Vaso-motor Paralysis; Monthly Bleeding from the Navel.*—Mrs. R——, aged 26, a slight blonde, originally of healthy constitution, now impaired by a succession of severe diseases during childhood and puberty, came to me for relief from dysmenorrhœal pains: the recurrence of a pleuritic attack, which had once before terminated in purulent effusion, interfered with the progress of the treatment, and after recovery the thoracic disease, by which the constitution of the patient had been undermined, mainly demanded attention, and I could only endeavor to relieve the more violent of the uterine symptoms, as a satisfactory improvement was not to be expected in a patient so enfeebled by thoracic disease. Among the symptoms which accompanied the menstrual exacerbation was a slight oozing of blood from the navel, which had been treated in vain by the family physician of the patient in a neighboring State; but after a partially successful uterine treatment the symptoms abated, to return some months after cessation of local treatment with an exacerbation of uterine disease.

CASE XXII. Mrs. X——, who had been under the care of various physicians, mentioned among her numerous ailments, the direct and indirect resultants of uterine disease, a menstrual bleeding from the nose, ears, mouth, and the corners of the eyes—a statement very much doubted at the time, but since proved. She informed us that for the past year, with an aggravation of pelvic trouble, these slight local hemorrhages had appeared, and recurred with greater severity whenever cold or exertion caused an increase of local suffering.

The reflex neuroses of the circulatory system cannot be classed among the most annoying, as they are rarely so severe as to cause great suffering. Like all other reflexes, relief is vainly attempted by direct treatment, but to a proper uterine therapy they yield readily. The palpitations of the heart, the burning in the top of the head, and the cold feet are among the most common and available as diagnostic signs of pelvic disease. Disagreeable to the patient are the cold feet, from which relief is vainly sought by hot water and hot bricks in the bed in winter; the feeling is a most disagreeable one, and annoying, as but little comfort is experienced from the heating of the bed: in this and in the nervous

irritability caused the reflex symptom differs from the cold feet, which are a simple evidence of sluggish circulation.

One of the more common of the peripheral vasculo-neuroses is the heat and burning in the side—not the burning of internal inflammation, but a reflex vaso-motor symptom, like the flush of the face or the burning in the top of the head—a pelvic burning, most frequently the accompaniment of ovarian disease, and generally limited to the side of the abdomen upon which the diseased ovary lies.

III. Respiratory Tract.

Through the connections of the pneumogastric with the pelvic nerves and ganglia an intimate relation is established between the respiratory and reproductive organs, and the morbid impulse conveyed by irritation of the uterine and ovarian terminals meets with prompt response in the respiratory organs, which results in symptoms on the part of pharynx, larynx, and bronchi so closely resembling disease proper, with pathological changes, that a correct diagnosis without the aid of tentative treatment is often impossible: so little appreciated is the possibility of such reflex origin that the patient becomes a martyr to medication, and unless, by chance, local symptoms reveal uterine disease and determine treatment, the entire materia medica may be exhausted in vain attempts to cure what is supposed to be a pharyngitis, a laryngitis, or an asthma.

Respiratory reflexes likewise occur as a response to irregularities of the stomach, so that gastric laryngitis and pharyngitis have become recognized forms of throat disease, and asthma is being looked upon more and more as purely nervous, a reflex vaso-motor affection. Dr. Glasgow in a recent paper[1] admits that asthma occurs at many of the critical periods of female life, and that a marked connection exists between the cavernous bodies and the uterine changes. He says that many women at the menstrual period have a vaso-motor excitement with great turgescence of the cavernous bodies and of the mucous membranes.

1. *Hystero-neuroses of the Pharynx.*—These neuroses, resembling a true pharyngitis in every detail, with the absence of only the febrile symptoms, I have observed only as menstrual neuroses due to uterine disease, appearing with the menstrual congestion, with uterine or general pelvic disease.

The entire pharynx may be affected, but more commonly the reflex is confined to the side corresponding to the side of the diseased pelvic viscus or to the side of the most intense morbid changes in the reproductive organ. The symptoms of disease are so manifest that the prac-

[1] "Etiology and Mechanism of Asthma," *Am. Journ. Med. Sci.*, July, 1887, p. 111.

titioner can hardly be blamed for resorting to astringent applications and internal medication unless he be warned by the peculiarities of the disease—marked among them the monthly recurrence regardless of temperature and exposure, which we should hardly expect in a simple pharyngitis. The cases which I have observed had all been previously treated by various practitioners, and at last, as they appeared so persistent and unyielding, with most powerful remedies, of course always to no purpose. Like all other reflex phenomena, the reflex pharyngitis and tonsillitis is inaccessible to local treatment, whilst it yields at once to improvement of the uterine or ovarian condition.

Case XXIII. *Genito-reflex Pharyngitis, with Tonsillitis, recurring monthly, unyielding to local medication, overcome by treatment of the pelvic disease; Causative Endometritis, Oöphoritis, and Perimetritis, most intense on the right side, like the pharyngeal symptoms.*—Miss B——, from B——, aged 23, had enjoyed good health until exposed to a severe cold by breaking through the ice while skating. The inflammatory conditions thereby excited in the pelvic viscera and imperceptibly progressing have finally undermined her entire constitution. Upon examination I found an endometritis with metritis and cervicitis, also cellulitis, especially marked in the right side like the oöphoritis. The patient complained of palpitations of the heart, general nervous prostration, weakness of the eyes, globus hystericus, and an inflammation of the throat recurring with each menstrual period: the pharynx is sensitive, the mucous membrane congested, the tonsil enlarged, especially on the right side. A few days before the appearance of the menstrual flow the tonsil begins to hypertrophy, and, regardless of any treatment, the swelling of the tonsil and congestion of the mucous membrane continue until the cessation of the flow. The patient, generally costive, is afflicted with a menstrual diarrhœa, which appears, like the pharyngitis, with the menstrual congestion a few days before the coming of the flow, and disappears during its continuance, to return for two days after cessation of the discharge.

I saw this patient before I had been attracted to the study of the hystero-neuroses, and paid but little attention to the pharyngeal symptoms: as she had come to me with well-marked uterine and ovarian disease, no treatment was attempted for the supposed pharyngeal disease, especially as I was told that the family physician, who had treated this recurring affection for many months, proposed to cut out the right tonsil, which was the one most inflamed during the attack, as all previous efforts had failed. Miss B—— had been under treatment but two weeks when the menstrual flow appeared. The pharyngeal attack preceded the flow as usual, but in a milder degree; the menstrual diarrhœa, however, appeared in a greatly aggravated form. My interest was now thoroughly aroused, and I attempted no treatment whatsoever

directly for the pharyngeal disease. With continued improvement in the pelvic symptoms the third period passed without any intestinal or pharyngeal reaction—neither diarrhœa nor pain nor swelling of the tonsil.

This is one of several cases precisely similar in character which came under my observation. I must observe that all occurred in young girls: whether this was an accidental coincidence or not I am unable to say. It is needless to relate histories of cases so similar in their nature: pelvic disease accompanied by a menstrual pharyngitis, with swelling of the tonsil, in one instance with follicular ulceration, reappearing monthly with the menstrual congestion, and ceasing soon after the disappearance of the flow; in another, in which examination and uterine treatment were not permitted, the reflex pharyngitis resisted all treatment by myself and at the hands of others; always worse with an exacerbation of the menstrual pains, improving only with an amelioration of the pelvic symptoms, to disappear after years with an improvement, local and general, brought about by rest, great care, and constitutional treatment. Several striking cases of this kind are recorded in the valuable paper on "Pharyngeal Neuroses due to Uterine Disease," by Dr. Edgar Holden of Newark, N. J., published in the August number of the *New York Medical Journal* for 1877.

Dr. Holden gathers four instructive cases from a number which have come under his observation: in all but one the patients were well-to-do, one only unmarried, the youngest twenty-four; the eldest, who had borne seven children, forty-three, approaching the change of life; two of them remarkably healthy and robust. The sufferings of the patients were continual and severe: their complaints were about the same, of intense aching pain just behind the whole length of the posterior pillars of the palate; sore throat extending up and down the sides; pain varying in intensity, often worse after fatigue, rarely lancinating, more of a slow, torturing ache.

In no case did the most careful examination, rhinoscopic and laryngeal, reveal any signs of disease in the parts complained of. The patients had been treated by Dr. Holden and by others for subacute pharyngitis with local applications of nitrate of silver or chloride of zinc, sometimes without benefit, sometimes with temporary relief, but in no instance with perfect success.

In the second case mentioned by Dr. Holden, after the treatment of the throat difficulty had been abandoned, the success being but partial, the patient came to him for treatment of her dysmenorrhœa due to anteflexion and endocervicitis. The erosion and inflammation were successfully treated, and the pharyngeal trouble disappeared, recurring at times, but permanent relief finally followed the removal of the extreme anteversion.

2. *Laryngeal Neuroses.*—By far more frequent are the laryngeal neuroses, marked by an intractable and disagreeable cough, short and hacking or spasmodic, accompanying the advent of puberty or referable to malposition or disease of the uterus. As in most of these reflex semblances of disease, examination reveals a healthy larynx, the vocal cords of a glistening white, slightly reddened by the constant exertion if the attacks are severe or the cough constant and frequent. This neurosis may accompany the irregularities of menstruation, especially during the advent of puberty, and disappear when the function is well established; but usually it is referable to a stenosis of the canal or a uterine catarrh, perhaps with painful dysmenorrhœa, and the coughing spell is coincident with the period of most intense menstrual pain: its reflex nature is thoroughly characterized by the ready disappearance upon proper uterine treatment and an utter indifference to laryngeal medication and manipulation, though sedatives will relieve: as soon as the uterine disorder is improved the cough ceases.

We must not confound with this hystero-neurosis hysterical aphonia or the laryngismus in nervous and hysterical women, those distressing paroxysmal attacks of coughing or of suffocation and strangulation, which are as harmless as they are alarming, and disappear as rapidly as they come. These we might call nerve reflexes, not referable to a certain genital lesion, fluctuating with its changes, coming with each menstrual period or with uterine exacerbation, but, like other hysterical symptoms, dependent upon the emotions.

3. *Hystero-neuroses of the Bronchi: Genito-reflex Bronchial Symptoms.*—When the bronchial filaments of the pneumogastric and those of the plexus pulmonalis respond to uterine irritation, the hystero-neurosis of the bronchi is developed, which is often most intense in character, and, like all other reflex symptoms, absolutely inaccessible to such medication as would appear indicated for the disease which is simulated: unless the key is found, and the often trifling genital lesion discovered from which the impulse is imparted, it is impossible to relieve the violence of the bronchial reflex, which may so harass the patient that health is impaired and the constitution undermined. Barnes in his paper on the "Relation of Pregnancy to General Pathology"[1] says: "There seems to exist a striking solidarity between the uterus and respiratory functions; the first is supplemental of the second. A notable proportion of the materials of the blood is expelled by the menstrual flux, and this fact explains the small activity of the pulmonary function whilst the uterus is active. With cessation of uterine activity at the menopause the lung function assumes greater activity; the quantity of carbonic acid exhaled is increased, as if to regain the level below which the menstrual flux had kept it; and with the thor-

[1] *Transactions American Gynecological Society*, 1876, vol. i. p. 141.

ough establishment of the menstrual flow the increased exhalation of carbonic acid which accompanies healthy development, and continues in boys, remains stationary."

An intimate relation exists between these important functional centres; and Barnes has described rather the coexisting and resulting symptoms, not the direct reflexes, which form a most important group; but the lungs and bronchi, by reason of the direct connection of the pneumogastric with cerebral and ganglionic centres, are also liable to be excited to reflex activity by a trifling stimulus imparted by other terminal irritations, especially from the nasal mucosa. The violent asthmatic attacks which sometimes occur as reflex symptoms were first recorded by Voltilini, and referred by him to nasal polypi; and even now the best known of the bronchial neuroses are those which appear in response to morbid states of the posterior nares. Hack[1] enumerates some of the more striking of these reflex neuroses: he has observed epilepsy, uncontrollable cough, asthma, and violent attacks of sneezing in response to such nasal irritation. Like the uterine reflexes, these nasal neuroses are confined, as a rule, to the side of the nasal disease, if that be unilateral: thus, a left hemicrania appears in response to a chronic catarrh of the left nasal mucosa.

Fraenkel has devoted much attention to the subject, and the remarkable cures achieved in asthmatic attacks, however violent, when of a reflex nature, by galvano-cauterization of the indurated mucosa aroused the delusive hope in certain recent writers, by false generalization from individual cases, that the form of asthma known as hay fever might be overcome by such cauterization.

Hack dwells at length upon the practical import of these reflex neuroses, and he gives expression to the same thought which I have so often enunciated—"that, however marked the causative relation in these cases, however well known the dependence of such reflex symptoms, practically this is ignored by the profession. The treatment in all cases is directed to the site of the symptom, and the patient is plied in vain with remedies, whilst a simple treatment, often a single application, might give relief if directed to the site from which the reflex emanates." Unquestionably, these reflex neuroses, whatever be their nature, though theoretically accepted, are practically disregarded. It seems but natural that an organ so intimately associated in function and in nerve-connection with the genitalia, so susceptible to reflex irritation, should respond readily to uterine stimulus.

The most common of these bronchial hystero-neuroses appear in the form of an irrepressible cough, a dyspnœa more or less violent, and the asthmatic attack, although either of the morbid conditions to which the bronchi are subject may be simulated. A true reflex neurosis, however

[1] *Berlin klinische Wochenschrift*, No. 25, 1882.

violent, is always unaccompanied by structural changes, and may be demonstrated with the certainty of the laboratory experiment in cases where the determining uterine status can be removed and reproduced at will; for instance, if this be a non-adherent movable flexion, as in the following case, already cited as Case IX. in my first paper on the hystero-neuroses:

Case XXIV. *Genito-reflex Dyspnœa; Uterine Asthma; Instantaneous Relief by Reposition of the Retroflexed Uterus.*—Mrs. S—— I first saw in consultation with Dr. Otto Greiner of St. Louis, by whose courtesy I am enabled to give the full history. The patient was an exceedingly irritable, nervous woman of forty-two, who had had four children; formerly healthy and strong, she had become emaciated to the last degree, with a careworn, haggard look; menstruation in former years was comparatively regular and unaccompanied by pain.

In October, 1875, she began to suffer from nightly attacks of asthma. When these attacks first appeared they presented all the symptoms of a nervous or hysterical asthma, with bronchial cough and expectoration toward the end of the attack as the asthma subsided. Coming every night soon after eleven o'clock, they would continue for an hour or more, according to their severity, and then disappear, leaving the patient entirely free from the annoying symptoms; but as the disease progressed her suffering became continuous, the trouble persisting, though in a milder form, throughout the entire day.

The case had gone from hand to hand, and the Pharmacopœia had been exhausted by the numerous physicians consulted; she herself, supposing a prolapse, had inserted various kinds of pessaries. From these facts, Dr. Greiner, when called in, suspected that the bronchial trouble might be in some way connected with a morbid condition of the uterus; and he was confirmed in this by the marked exacerbations a few days previous to the menstrual period, the bronchial asthma continuing unabated throughout the entire duration of the uterine congestion, and gradually yielding in intensity as the catamenial flow disappeared. The symptoms always abated more or less after the cessation of the flow, but continued throughout the intermenstrual period, again to become more violent at the approach of the next period.

Notwithstanding the grave symptoms, auscultation and percussion revealed but little, while upon vaginal examination Dr. Greiner found an elongated, acutely retroflexed uterus, movable and straightened by the probe without much difficulty. He introduced a sponge tent: the patient soon began to feel more comfortable, and in less than twelve hours the annoying cough and asthma which had so long troubled her entirely disappeared. An intra-uterine stem, ingeniously constructed to suit the case by Dr. Greiner, was next introduced, and as long as it

could be borne without irritating the mucosa the cough and asthma ceased.

The symptoms, as I have myself several times observed, would abate soon after the introduction of the stem, to cease entirely within a few hours, but upon removal of the instrument the former suffering was sure to return in from five to twenty-four hours.

The bronchial symptoms responded with the greatest certainty and regularity to a change in the position of the womb.

Retroversion pessaries did but little good, some even proving injurious; pressure, even the slightest, on the posterior wall of the corpus uteri caused intense pain and a fearful exacerbation of the symptoms, as was demonstrated by a glycerin cotton tampon which had been introduced with a view of elevating the fundus.

At last the stem could no longer be borne, and the patient's suffering became so unbearable at the time of the catamenia, while she was free from the asthma for two weeks of the intermenstrual period, that I determined to bring about the menopause by Battey's operation. I removed both ovaries, but the patient, enfeebled by long suffering, died on the sixth day after the operation.

The post-mortem examination showed the lungs to be almost normal, somewhat emphysematous, but the bronchi free, nowhere enlarged, their mucous membrane perhaps a trifle thickened; thus it was evident that the dyspnœa and the severe and continuous cough with muco-purulent sputum was a purely nervous phenomenon, and clinical experiment had shown the causation to be uterine.

Case XXV.—An analogous case is related by Prof. Hegar of Freiburg.[1] The patient, a maiden lady, 31 years of age, had been troubled during the period of puberty with an annoying cough, which returned in her twenty-sixth year and grew constantly more troublesome; she complained of intense cervical and hypogastric pains, bearing-down and other uterine pains, loss of appetite, but, above all, of the hoarse, irritating, and constant cough, which was only temporarily relieved by the use of strong opiates; menstruation was profuse and painful. Examination revealed an anteflexion, with chronic metritis and oöphoritis.

The introduction of an intra-uterine stem pessary afforded almost instant relief from the terrible coughing spells, precisely as in my case, where it was used to overcome the retroflexion, and Prof. Hegar's further experience with the stem was perfectly analogous to my own. It seemed to act unfavorably in other ways, so that as the period approached he was obliged to remove it; in from three to four hours after the removal the attacks returned with all their former severity. The stems were used for several months, but although the cough was

[1] *Wiener med. Presse*, 1877, Nos. 14, 15, 16, 17.

checked the pain, irritation, and menorrhagia grew unbearable, and the use of the instrument was given up. Electricity, as well as all medication, failed, and the extirpation of the uterus and the ovaries was determined upon, as the condition of the patient was such that she must apparently soon succumb, and it was highly probable that the cough would subside upon removal of the uterus and ovaries. The operation was successfully performed, and up to the date of the writing of the article, three months after the extirpation, the cough has not reappeared. Similar cases are cited by Chroback,[1] Grünewald,[2] and Tripier.[3]

Hodge gives a number of cases in point: after referring to that tired feeling of the chest and the nervous cough—the dry, the hard, and the paroxysmal cough coexistent with the irritable uterus—he cites several which are decided bronchial hystero-neuroses, as their dependence upon uterine disease is made clearly manifest.

Case XXVI. *Genito-reflex Dyspnœa; Uterine Asthma, disappearing upon Relief of the Causative Uterine Disturbance by Conception.*—Mrs. X——, 48 years of age, had for many years been a sufferer from terrific attacks of asthma; was in no way affected by internal medication, but somewhat relieved by cauterization of the sensitive area of the nasal mucosa by my friend Dr. Glasgow, who kindly gave me the details of the case. Though somewhat ameliorated and diminished in intensity, the disease persisted until conception took place, when a perfectly healthy functional activity of the respiratory organs was re-established, and up to date, the eighth month of pregnancy, breathing has been perfectly normal, and no evidence, even the slightest, of the before so violent asthma has been observed.

Case XXVII. *Bronchial Hystero-neurosis of Pregnancy.*—Mrs. X—— consulted my friend Dr. Glasgow on account of a persistent asthma which had developed with conception, persisted throughout pregnancy, and was still continuing, then in the seventh month. The patient is a lady in whose family a disposition to asthma has existed; in other members of the family the attacks have been brought about by very trifling exciting causes: in one sister a slight cold appeared as the impelling cause; in another, a laryngeal trouble—both responding to proper treatment. The reflex nature of the attack in this instance was made evident not alone by the peculiar coincidence of its appearance with conception, but by the utter failure of constitutional and local treatment from which relief could be expected.

Whilst in the first case a displacement of the uterus, possibly a retro-

[1] *Wiener med. Presse*, 1869, Nos. 1 and 2. [2] *Petersburger med. Zeitschr.*, 1875, p. 575.

[3] *Leçons de Forme et de Situation de l'Utérus, etc.*, Paris, 1874, p. 87, Observ. xxii., xxiii.

flexion or a narrowing of the canal, which had excited the reflex symptom, was overcome by the functional changes consequent upon pregnancy, and thus, the cause being removed, the bronchial reflex abated, in the second the physiological hypertrophy of the uterus due to pregnancy seemed to produce the irritation which resulted in the bronchial response: most likely with parturition, the emptying of the cavity, and the contraction of the organ the reflex symptoms will abate.[1]

Case XXVIII. *Bronchial Hystero-neurosis; Cheyne-Stokes Respiration determined by the Menstrual Exacerbation of Chronic Uterine Disease.*—Mrs. C——, from Warrensburg, Mo., aged 26, consulted me in November, 1886. Examination revealed laceration of cervix and perineum, erosion of the congested and everted lips, retroflexion of the enlarged uterus, and metritis, endometritis, and oöphoritis. Intense backache was the only symptom characteristic of these morbid conditions, which resulted from a first and only labor three years ago, and which had caused complete nervous and physical prostration and a variety of reflex neuroses, prominent among which seemed those of the pneumogastric—pain in the heart, palpitations exciting a fear of heart disease, nausea, belching, distension of the stomach, and Cheyne-Stokes respiration: while cardiac and gastric symptoms persisted in a milder form, a violent exacerbation, together with a development of pulmonary symptoms, accompanied the menstrual congestion, the thoracic pain, and the peculiar respiration so characteristic of pulmonary disease, and I requested the opinion of my friend Dr. Glasgow in the case. Although the breathing was characteristic and the patient gave a history of repeated attacks of pleurisy and "lung fever," he could detect no pathological changes, and assured Mrs. C——, as I had done, that her lungs were in a perfectly healthy state, notwithstanding the distressing symptoms. We observed this neurosis, which had appeared with the development of pelvic disease for the past year, during two menstrual periods; it was most intense, the peculiar respiration most marked during the violent menstrual attack following her journey to the city, by which the uterine symptoms had been aggravated. The period following, after the inauguration of treatment, and after the patient had had an opportunity to rest properly, passed off with all symptoms less severe.

As treatment progressed and the displacement was relieved, the inflammation reduced, the erosion healed, the bronchial neurosis ceased, likewise the cardiac. The gastric symptoms alone remained, but in a milder form. With constant improvement the menstrual

[1] Dr. Glasgow has kindly informed me since that his expectations have been realized—that the asthmatic attacks, which persisted throughout pregnancy regardless of treatment, ceased immediately after confinement, proving them to have been pure physiological reflexes.

pains constantly diminished, and the bronchial neurosis has never reappeared.

Case XXIX. *Genito-reflex, Dyspnœa, and Cardiac Neuroses; Difficulty of Breathing; Palpitation of the Heart; Distension of the Stomach, resulting from Laceration of the Cervix and consequent Hyperplasia with Descensus Uteri; Persistent or Pathological Neurosis permanently checked by Galvanism to the Uterine Terminals.*— The patient, Mrs. H——, had been a constant sufferer from violent reflex neuroses excited by uterine disease, and her insomnia added to the bodily and nervous prostration. In this case the palpitation of the heart and dyspnœa were so marked that after walking fifty steps the patient had to keep her mouth open and gasp for air. She could not walk up a single flight of stairs without resting a few times, rarely attempting to walk two squares to market. The neuroses were constant or pathological, with a slight exacerbation at the menstrual period and after cold or exertion, by which the uterine disease was aggravated.

Before resorting to operation upon the lacerated cervix I decided to relieve the inflammatory symptoms with mild astringent applications to the endometrium, medication to cervix and cul-de-sac by powders and medicated cotton, and reposition of the uterus by the elastic tampon. As the uterine congestion diminished, discharge and erosion bettered, her suffering was lessened; she slept more and complained less of palpitation and dyspnœa; still, she was unable to walk up stairs or any distance on level ground with comfort. Believing that the hyperplasia of the uterus would be more readily reduced by galvanism, I resorted to electrolysis by galvano-puncture in addition to the before-mentioned treatment. A platinum needle attached to the negative pole of the galvanic battery was inserted to the depth of one inch into the indurated uterine tissue, the positive dispersing plate upon the abdomen: a current of 40 milliampères was employed for five minutes. Two days later the same treatment was repeated, and while still upon the table the patient gave a sigh of relief, and before leaving the room told me that she now felt well. I did not see her for three days, and when she returned she appeared in the best of spirits, completely relieved of all the annoying reflex symptoms. She slept soundly throughout the entire night; could walk any distance, even go rapidly up stairs without any discomfort. The dyspnœa had entirely disappeared, and by the operation undertaken soon after her health was completely restored.

The sudden disappearance of the violent neurosis in this case is evidently due to the sedative action of galvanism, as it is not possible that a single treatment could so suddenly cause so great an amelioration of the uterine disease as to remove the exciting cause of the reflex neurosis; but, as so pointedly shown in Case IV., in which the reflex neuroses, which persisted after the removal of uterus and ovaries, were relieved

by galvanic treatment of the irritated nerve-terminals, in which the molecular disturbance excited by uterine disease had continued after the removal of the exciting cause, so I believe in this case the morbid nerve-irritation was overcome by the galvanic current, and thus the reflex neurosis checked whilst the causative disease continued.

IV. The Gastro-intestinal Canal; Reflex Gastro-intestinal Neuroses.

Though not so strange or so striking as many of the other phenomena resulting from uterine disease, the reflex neuroses of the gastro-intestinal tract are important to the practitioner, especially on account of the frequency and occasional violence of the most common of these reflexes, the gastric neurosis of pregnancy. We will consider—

First, the hystero-neuroses of the stomach;

Second, those of the intestines.

1. *The Genito-reflex Gastro-neuroses.*—Fulness in the epigastric region, gaseous distension of the stomach, loss of appetite, belching, nausea, and vomiting—all the symptoms of indigestion, even of gastritis—may be determined by morbid or physiological changes in the reproductive organs. Like other neuroses, without medication these annoying troubles gradually disappear as the uterine disorder yields to local treatment; whilst before the inauguration of such treatment any remedies that may be given to ease the suffering caused by the apparent gastritis will be either fruitless or will at best afford but partial and temporary relief: sedatives and anodynes alone allay the intensity of the symptoms, and may even completely calm the nervous excitement. The semblance of disease is so perfect that unless the monthly recurrence or the existence of known pathological or physiological uterine changes be verified, a tentative treatment only will determine whether it be a mere phantom of disease or the result of actual pathological changes.

Gastric neuroses occur in response to physiological or pathological changes, and we need scarcely consider all the varieties, often trifling in character: the most important are the nausea and vomiting of pregnancy, often with fatal termination, and the gaseous distension of menstruation: belching, nausea, and vomiting as a menstrual neurosis, dependent upon the exacerbation of uterine disease with the monthly congestion, may be most violent in character. The diseased sexual organs may excite the gastric nerve through the sympathetic, and it is claimed by Jaffé[1] that the reflex vomiting is brought about by irritation of the vomer centre by a morbid stimulus imparted by reflex action to branches of the vagus or the gastric nerves.

The insidious control exercised upon the stomach by the reproduc-

[1] *Dyspepsia uterina, Memorabilia,* 1886, No. 4, Frankfort-on-the-Main.

tive organs is well marked by the frequency of the epigastric faintness which is a direct resultant of uterine changes, physiological and pathological. As Tilt expresses it, the vagus is a bridge which unites the central portion of both nervous systems, resembling both, not well isolated, often anastomosing with the sympathetic, which helps to form the cœliac plexus, so that affections of the vagus and the epigastric ganglia generally coincide, and the viscera by their ganglia react upon the brain, and a paralysis of the epigastric centres causes this uneasy sensation in the pit of the stomach, the feeling of sinking and faintness, nausea, weakness, and perverted appetite. Hyperæsthesia or paralysis of the solar ganglia and cœliac plexus may result from uterine disease. Tilt, however, over-estimates the frequency or importance of this gangliopathy, as he calls it. Though it may be more frequent in response to the changes of the menopause, it does not play so important a rôle as a reflex to uterine disease or the earlier physiological congestions. These spells of faintness, this sinking feeling of emptiness, which we also find in patients suffering from uterine disease, are a direct reflex occasioned by uterine or ovarian congestion, as is evident by their direct cessation upon an improvement in the uterine condition. Were they a mere resultant of constitutional debility caused by uterine disease, relief would not immediately follow local improvement, but would result only from an improvement in the tone of the system, which is but slowly effected after a cure of the pelvic disturbance.

This epigastric faintness, though annoying, is not of as much importance even during the menopause as it is supposed to be by Tilt, who finds it in 220 out of 500 of his cases, and claims that "women voluntarily unfasten their stays and clothing on account of their liability to gangliopathy; and for this reason many of my patients have left off their stays," he says—a striking example of an explanation suited to the wishes of the writer. This leaving off of corsets and unfastening of stays is not, in the main, to avoid the epigastric pressure, but to prevent that downward pressure of the intestines upon the reproductive organs, and of these downward into the pelvis, by which an exacerbation of uterine and ovarian symptoms is caused. Pressure from above is injurious, as descensus takes place when the patient is in the erect posture; and the hint is thus given by nature to the physician that he instruct his patients to avoid those dangerous garments altogether, and to support their clothing from the shoulders, that they may prevent this injurious pressure.

(*a*) *Constant, strictly Pathological Hystero-neuroses of the Stomach*—belching, nausea, and vomiting, caused by reflex irritation of the gastric nerve—are less frequently a permanent accompaniment of uterine disease; more commonly they are excited by the menstrual congestion. So closely resembling the various forms of dyspepsia and the well-

known gastric symptoms, they are usually treated as such, and, I regret to say, notwithstanding the strong arguments and the striking cases cited in my first paper, I seemed to remain alone in my ideas as to the causative relation of these phenomena. But lately the reflex nature of these symptoms has been more fully appreciated, as we see from the case cited by Jaffe.

Case XXX. *Pathological Genito-reflex Gastro-neuroses: Symptoms of Gastric Catarrh, cured by Treatment of Existing Endometritis.*—Patient, 23 years of age, suffering greatly from nervous prostration, complained of heartburn, eructations, and vomiting after meals. Constitutional treatment was at first resorted to: iron and other tonics were given, but without effect. The stomach-pump even was tried, and showed a perfectly healthy condition of the gastric mucosa; the stomach was clear of secretions, not over-acid. The uterine symptoms, which had been neglected on account of their apparently trifling importance as compared to the gastric and constitutional condition, were now examined into and a douche was ordered. The stomach grew worse, evidently in consequence of the irritation caused by the examination. As the vaginal injection proved useless, local treatment was insisted upon; the uterus was anteflexed, the body enlarged, the mucosa diseased; the curette was resorted to for the relief of the endometritis, and the cavity thoroughly cleansed; the belching and vomiting ceased at once and the stomach was restored to a healthy condition, but after a time the dyspeptic symptoms slowly reappeared, not with that severity and without vomiting.

This is evidently a reflex neurosis, well demonstrated by the imperfect treatment of the case. Metritis and endometritis of long standing are not suddenly cured by a single curetting, although the diseased mucous membrane is much improved and an opportunity given for cure by prolonged treatment. With the improvement following the curetting the reflex symptoms ceased, but as the advantage was not followed up, the uterine condition again grew slowly worse, and with it the gastric neurosis reappeared. Had curative treatment been inaugurated immediately after the operation, a permanent cure would have been effected.

Case XXXI. *Pathological Gastro-neurosis.*—Mrs. W——, aged 27, began to menstruate in her fifteenth year; has always been regular, with pain on the first day and a profuse flow. Married at seventeen, she bore two healthy children: she first began to complain six years ago of lassitude, headache, backache, and unusually profuse menstruation; at the same time gastric symptoms developed; her stomach was continually deranged, weak, with a feeling of fulness after taking any, even the lightest, food. She was under treatment for almost two years for the uterine derangement, but experienced so little relief that she

ceased all medication for the next two years, when her suffering increased, and she consulted me in the spring of 1875.

Combined with pelvic complaints were all the symptoms of a chronic catarrh of the stomach.

I found a slight prolapse of the tumefied, retroverted uterus, the lower lip elongated, hard, and nodular, and an eroded granulating surface surrounding the os; the bowels irregular, often bloated; during the menstrual period there was profuse and continued hemorrhagic flow, which I found it difficult to check. Suspecting a granular condition of the uterine cavity, I made a digital examination after dilating with sponge tents, and removed the excrescences with the scoop. The operation was followed by speedy recovery, and with the improvement of her pelvic suffering the distressing gastric symptoms disappeared, although I had before in vain sought to remedy the evil with bismuth, pepsin, nux vomica, and similar agents.

At a later date I was obliged to insert a Hodge pessary, as the retroversion became more marked and caused annoyance, backache, bearing-down pains, and a slight return of the stomach trouble; the instrument at once relieved both pelvic and gastric trouble, but at times, when she has not worn it for several days, her digestion again suffers.

CASE XXXII.—Several equally marked cases have been since reported. The first was by Dr. Wm. M. Chamberlain at a meeting of the New York Obstetrical Society, September 19, 1876.[1] In this case the point of irritation at which reflex action was excited is supposed to have been at the os internum, as this was the seat of a small fibroid which acted as a ball valve, and when it closed the canal the stomach trouble appeared: not medication, but removal of the fibroid, brought relief to the sufferer from so-called chronic gastric disease.

Patient 30 years of age, married. Has one child, now five years old, after the birth of which symptoms of uterine disease began to appear; during gestation the nausea and vomiting had been excessive; three years later she had gastric trouble, nausea, vomiting, and a boring, burning pain in the epigastric region; no food could be retained, so that for twenty-seven days she was kept alive by enemata. She slowly improved, and finally recovered.

This patient again became pregnant, and all the old symptoms recurred. At this time Dr. Chamberlain first saw the patient in the second month of her pregnancy, and finding the pregnancy to be complicated with large uterine fibroids, a smaller one being within the cervix, determined to produce abortion. He began dilating at 11 A. M., and at 7 P. M. vomiting, pain, and all other distressing gastric symptoms had ceased. They began to diminish in two hours, and five hours afterward she ate a hearty meal. When the cervical canal was open and

[1] *Am. Journ. Obstet.*, January, 1877, p. 98.

unobstructed, the patient was comfortable, but with every labor-pain, as the fibroid was forced down and the valve closed, the nausea, gastralgia, etc. returned.

Dr. C. justly remarks that the old trouble two years ago was undoubtedly uterine in its origin, as the last was distinctly proved to be.

Case XXXIII.—The other case, a "sympathetic hystero-neurosis of the stomach," by Dr. Formento of New York, appeared in the July number of the *American Journal of Obstetrics* of 1877.

Intractable vomiting and hysterical convulsions lasting for several years, caused by the indurated conical cervix with stenosis of the canal, were cured by incision and dilatation. The patient was a healthy lady of twenty-one, who had known no uterine suffering save a somewhat painful though regular menstruation previous to marriage. The vomiting, unaccompanied by any pain in the epigastric region or other symptom indicating organic disease of the alimentary apparatus, at first appeared soon after marriage, then coming only in the morning when the stomach was empty. It gradually became more frequent, coming at all times, before and after meals, often provoked by some unpleasant sensation or a slight moral impression. The patient soon lost flesh; there was extreme prostration with perversion of moral and intellectual faculties. Finally, these disorders of innervation went so far as to produce convulsions, with complete loss of consciousness, general and at times partial anæsthesia, or during certain attacks extreme hyperæsthesia; at times phenomena of catalepsy, or trismus, opisthotonos, contractions of pharynx, œsophagus, etc. These occurrences often took place several times during the month, menstruation continuing regular, neither more difficult nor less copious than normal.

Several physicians had been consulted: antispasmodics, tonics, hydropathy, electricity, sea-baths, mineral waters, blisters, morphia hypodermically, etc., had all been tried in vain. Dr. Formento found an abnormal sensibility of the external organs, a narrow vagina, a conical, hard, resistant cervix of a deep-red color and smooth surface; the external os scarcely visible and impermeable even to the smallest sound; the uterus normal in size and position.

The cervical canal was enlarged by bilateral incision in its entire length, especially at its two orifices, and before the incision healed the vomiting had ceased; the external genitals and cervix became more natural, the congestion disappeared, and a large sound could be readily introduced to the normal depth; all suffering was relieved, and the patient became cheerful, strong, and healthy.

This satisfactory condition continued for nine or ten months following the operation, when the derangements of the stomach and nervous system again began to appear. Upon examination the os and cervical canal were found to have become considerably narrower than they were

two months after the operation: this was now repeated, the same immediate and remarkable amelioration following and continuing for over a year; then, again, for the third and fourth time, the knife was resorted to. After a period varying from ten to sixteen months the return of the same disorders compelled Dr. Formento to have recourse to the same method of treatment, always with the same good result.

The symptoms in different patients necessarily vary, but more in intensity than in kind. I have cited these cases at length in order to elicit the gastric symptoms as they appeared in each, and more particularly to demonstrate the causative relation existing between the affections of the stomach and the uterus, and the dependence of these reflex phenomena upon chronic uterine disease. However frequently these cases have come under my observation, I have seen none more characteristic than those cited in my first paper.

(*b*) *Menstrual Hystero-neuroses of the Stomach.*—Whilst nausea, hiccough, and vomiting may appear as menstrual hystero-neuroses, the most frequent of the menstrual hystero-neuroses is the gaseous distension of the stomach, accompanied by either pain, nausea, or vomiting—the menstrual hystero-neurosis of the stomach *par excellence*. It was the frequency of this peculiar symptom and its strict dependence upon the uterine condition which first called my attention to the reflex neuroses; and I believe that I am safe in saying that at least one-third or one-fourth of all female patients suffering from pelvic disease have this enlargement of the stomach at the time of the menstrual engorgement, so that this swelling, which appears not with the flow, but a few days earlier, with the uterine congestion, may be looked upon almost as an indication of the approaching catamenia. This neurosis accompanies almost every menstrual disorder, and yet it is not referred to in our textbooks, and it is but little known to the practitioner in its relation to the female sexual organs, so that a case of this kind when observed is usually treated as an indigestion or a gastritis. 64 of the 174 patients in the Female Hospital in this city in 1876 and 1877 suffered from the menstrual hystero-neurosis of the stomach—36 per cent. I made these examinations repeatedly at intervals of several months, examining indiscriminately patients from surgical, medical, venereal, and lying-in wards, and I always attained about the same per cent. 34 out of 94 patients examined in July, 1876, complained of the menstrual swelling, and when after a complete change of inmates the rounds were again made in August, 1877, 29 sufferers were found among 80 patients.

Symptoms of the Menstrual Hystero-neurosis of the Stomach.

Swelling only, or with pain and indigestion	46 per cent.
Swelling with nausea	19 "
Swelling with nausea and vomiting	16 "
Nausea, often with pain, very slight swelling	19 "

Time of Appearance of the Symptoms in Relation to the Menstrual Flow.

Immediately preceding, or together with, the appearance of the flow	10.6 per cent.
1–2 days before appearance of the flow	37.9 "
2–3 " " " " "	27.3 "
3–4 " " " " "	9.0 "
5–6 " " " " "	3.0 "
7 days, more or less, before the appearance of the flow	10.6 "
In middle of intermenstrual period	1.5 "

Disappearance of the Neurosis.

With appearance of the menstrual flow	61.8 per cent.
On the first and second days of the flow	25.4 "
With cessation of the flow	12.7 "

Duration of the Neurosis.

Several hours	3.7 per cent.
1–2 days	11.2 "
2–3 "	42.6 "
3–4 "	14.8 "
4–5 "	7.4 "
6–8 "	20.3 "

Symptoms.—The symptoms of this neurosis are somewhat varied; its appearance is, however, always ushered in by a distension of the epigastric region, more rarely of the entire upper part of the abdomen: the patient will always speak of the "swelling of the stomach," which often becomes so marked that the clothing must be very much loosened if it be worn at all. The enlargement is, in almost all cases, confined to the epigastric region, which is tense, sensitive to the touch, and extremely tympanitic. This flatulent distension is frequently accompanied by more or less pain in the stomach, cramps, and bearing-down pains, or cramps and pains passing from the stomach down into the back.

The backache and headache, or fulness of the head, which so often precede and accompany difficult menstruation, generally complicate the neurosis of the stomach.

In at least one-third of the cases (35 per cent.) nausea succeeds the swelling, and when once established continues until the cessation of the neurosis. In more aggravated cases the gastric discomfort is such as to produce vomiting, but this only when the neurosis is at its height, shortly before the flow, and it ceases, as all other symptoms do, with the appearance of the catamenia. In only 16 per cent. of the cases was the distension accompanied by vomiting, and then not regularly with every period, but only when all the symptoms were intensified. Sometimes we find indigestion, frequently anorexia, but in some instances a very good appetite, notwithstanding the nausea: the flatulent distension of the stomach as a reflex phenomenon is not neces-

sarily accompanied by that disgust for food which is a symptom of gastric disease.

Time of Appearance and Duration of the Neurosis.—This neurosis of the stomach generally (65 per cent. of the cases) makes its appearance from one to three days before the catamenia: beginning with the distension of the epigastrium, the symptoms increase and reach their climax just before the coming of the flow, and they disappear (62 per cent. of the cases) when the engorged uterus finds relief in the escape of the sanguineous fluid.

In some cases the symptoms do not appear until the coming of the flow (10.6 per cent.), and rarely are they found as early as the fourth (9 per cent.) or the fifth or sixth day (3 per cent.) before its appearance. In 10.6 per cent. of my cases they came on a week previous to the flow, lasting until its appearance, and in two cases in the middle of the intermenstrual period.

These gastric symptoms generally disappear at once when the menstrual discharge comes on; occasionally they continue until the flow is freely established on the first or second day (25.4 per cent.); less frequently (12.7 per cent.) do they last throughout the entire duration of the period. The average duration of the menstrual hystero-neurosis of the stomach is consequently from one to three days (54.0 per cent.), seldom but a few hours (3.7 per cent.); in 14.8 per cent. it was from three to four days, in 7.4 per cent. from four to five days, but again more often (20.3 per cent.) from six to eight days.

Time of Development of the Neurosis.—Only 34 of the 70 cases observed were carefully questioned as to the time at which the distension of the epigastrium in connection with the catamenia had been developed. Of these 34 patients, 25 (73.5 per cent.) had observed this more or less annoying symptom from the time they first menstruated, and it had returned regularly with each period, always preceding the flow, so that they had learned to look upon it as a part of the suffering to which they were doomed during the continuance of their sexual life. It is probable that for reasons such as this the advice of the physician is not often sought by women suffering with this trouble; and when he is consulted, as in several instances related to me, it is in aggravated cases, which are naturally looked upon as very serious forms of gastric derangement because his attention has never been called to the milder forms of this affection or to its causes and relations. It might be of interest to add that the age at which menstruation appeared varied greatly, ranging from the eleventh to the nineteenth year.

In the 9 other patients (25.5 per cent.) the neurosis appeared later in life in connection with uterine disturbances; 6 of these first observed the gastric suffering upon the reappearance of the menstrual flow after childbed, mostly when this had been aggravated by uterine inflamma-

tion. In one instance the swelling appeared at the same time with the development of uterine disease; in another after marriage, by which the congestion of the anteflexed womb and all menstrual suffering was increased. And in only 1 of these 9 cases is no sufficient cause mentioned for the late appearance of the neurosis.

Conditions under which the Neurosis is Found.—My statistics are gathered entirely from women in the lower walks of life, as I was dependent for data and comparisons upon the 174 patients of the Female Hospital: these were mostly servants, quite a number were prostitutes, some housewives, seamstresses, and laundresses.

During the short space of time which has elapsed since my attention was first called to this point I have not been able to gather a sufficient number of cases in private practice to allow the expression of a settled opinion, but my impression is that the menstrual neurosis of the stomach is somewhat less frequent among the more comfortably situated classes.

The ages of those examined cover almost the entire range of menstrual life, from the fourteenth to the fifty-first year, and the diseases from which they were suffering at the time were such as will be found in a general female hospital.

Connection with Uterine Disease.

Cases in which the neurosis appeared		63
Under treatment for uterine disease	16	
No uterine disease acknowledged	47	
Cases in which the neurosis did not exist		111
Under treatment for uterine disease	15	
No uterine disease acknowledged	96	
Total number of cases examined		174

Of the 31 cases in the hospital under treatment for pelvic trouble, 16 suffered from the neurosis; but as vaginal examination was not made in all cases, it is impossible to say how many of the other patients labored under some slight uterine difficulty unknown to themselves or not acknowledged to the physician.

Of the 7 private cases which I have recorded in my first paper as showing the menstrual hystero-neurosis of the stomach, only 1 was free from severe uterine disease.

In many of those cases of neurosis in which the patient did not complain of the symptoms of uterine disease an irregularity of menstruation was found: thus in 27 of 36 patients whose histories were more carefully recorded menstruation was decidedly abnormal, mostly irregular, or, if regular, profuse and of long duration or very scanty. In the other 9 the flow was perfectly normal; in 8 of these 9 cases the swell-

ing had been noticed since the first appearance of the courses, and had since then regularly preceded every period.

The cases in which menstruation is regular and normal are mostly the milder types of the neurosis, and in the mildest forms the flow is always regular.

The most severe cases, in which the epigastric swelling is very marked and painful, occur when the menstrual flow has been checked by some pathological influence in patients suffering from the neurosis; thus, a woman, now thirty-one years old, first menstruated at fourteen, and, affected with the neurosis since that time, did not see a return of the period until her eighteenth year, the flow having been checked by a severe cold. In these four years during which the menses did not appear the neurosis returned regularly each month, being more severe and causing her greater suffering than she had experienced while the flow was regular, both before it was checked and since its reappearance: her case is still one of the most troublesome. I find several other equally marked cases among the number recorded, and I deem them most instructive, as showing the dependence of the neurosis upon uterine engorgement.

In those cases in which a physiological cessation of the flow takes place, as in consequence of conception, I could detect no regularity in its effect upon the neurosis; thus the patient last referred to, whom I saw in childbed, tells me that her stomach was in a very fair condition throughout the entire period of pregnancy, and that she did not suffer from vomiting until the last month; another, who has suffered greatly from the neurosis since puberty, says that she had never felt so well as during the nine months following conception, and that her stomach had never before been in so good a condition; on the other hand, in some patients so affected swelling and tenderness of the stomach with vomiting always appear at the end of the first month of conception and continue throughout pregnancy, which may be brought to a premature termination by the suffering and debility of the patient if the medical attendant does not himself resort to the only means of relief—an early abortion.

I recall two marked cases of this kind, in both of which I was summoned in consultation on account of the excessive vomiting and gastric suffering.

The history told of menstrual hystero-neurosis; the courses had been missed in one case but once, in the other twice, and the suffering and vomiting dated from the period at which the flow was for the first time vainly expected. This at once led me to infer a conception, and I was enabled to verify the diagnosis: in one case I was obliged to relieve the uterus of its contents, after which the vomiting at once ceased.

Causes of the Neurosis.—I can adduce no better proof of my theory, that this gastric disorder is a reflex neurosis dependent upon a pathological condition of the uterus and a disturbance of its functions, than by citing the following characteristic cases:

Case XXXIV. L. S——, aged 31, Bohemian; healthy during childhood; first menstruated in her fourteenth year; has been regular, without pain or bloating; married at twenty-three; had five children. Since her last childbed, in 1873, she has been troubled with a swelling of the stomach at the time of her courses; this precedes the flow by one or two days and ceases with its appearance. As the patient herself expresses it, she feels at that time "just as if she were in the family way;" the stomach is distended and tender; she is nauseated, has no desire for food, but rarely vomits; is greatly debilitated by each attack of this kind, and has been incapacitated for work for several months, being often confined to her bed for days at a time. I saw the patient in May, 1876; the examination showed a prolapse of the uterus with elongation of the cervix; operation was refused. I reduced the prolapse and retained it in place by a Hodge pessary, advising in addition to this the use of astringent cotton tampons. In October, 1876, Mrs. S—— returned, now a healthy, strong woman, earning a livelihood for herself and an idle husband by washing: the next flow after the introduction of the pessary passed off without the usual suffering, and *the hystero-neurosis has not returned since the uterus has been in place.* The prolapse also is so far improved that she no longer wears a pessary or tampon unless she is looking forward to an unusually severe day's labor.

Others of the genito-reflex gastro-neuroses which are strictly due to pathological causes and cease with their removal appear during the physiological congestion of the catamenia, and hence resemble the menstrual reflexes proper. As an example of such neuroses I may cite some peculiar cases of perverted appetite, a gastro-neurosis which has by no means received the merited attention: the school-girl who refuses her wonted food, and, regardless of admonition and medication, endeavors to subsist on pickles, on bread and sugar, or other such unusual articles as her fancy may crave, is ridiculed, scolded, or punished as a wilful, disobedient child, while she is suffering from the effects of a morbid gastric stimulus due to puberty, some malposition or cervical catarrh, and physician and parents merely aggravate her condition by gross mismanagement.

Occasionally this peculiar symptom persists as the result of uterine disease, when it is of course attacked by gastric medication, but it is most frequent during physiological periods—during puberty, menstruation, and pregnancy: known to the ancients, known to the laity, as a resultant of conception, ever considered as a certain evidence of pregnancy, the physician of the present day still seeks to overcome this

reflex by gastric medication, instead of attacking the causative uterine lesion.

It is well known as a symptom of pregnancy, and cited as one of the early signs, and it is unnecessary to substantiate this by the rehearsal of familiar cases; less common is the pathological reflex, of which a typical case is appended:

CASE XXXV. *Ravenous Appetite accompanying Menstrual Congestion immediately before and after the Trifling Show; Amenorrhœa, Endometritis, Perimetritis; Relief by Local Treatment.* Gynecological Department, St. Louis Polyclinic.—Lizzie ——, a colored girl 19 years of age, fairly developed, has never been regular; her menses, appearing in her fifteenth year, have always caused her great pain, with a slight, scarcely perceptible, flow, which has even diminished of late, coming for an hour or two only. The patient complains of backache, hypogastric pains, distension of the abdomen, and general languor; the uterus is small, retroverted, with an anteflexion of the fundus, and the still existing right perimetritis is probably the cause of all her troubles. Two days before the appearance of the flow, with the menstrual congestion, patient develops a ravenous appetite, eats constantly anything and everything within reach; roams about the house at night to seize upon whatever is available. If the flow continues for any length of time, the symptoms abate to return a day or two after. The girl has now been under treatment for two months; the endometritis is greatly bettered; the menstrual pains have diminished; the flow is increased in quantity; and the ravenous appetite has yielded to a normal condition.

CASE XXXVI. *Genito-reflex Intestinal and Gastric Menstrual Neuroses; Looseness of Bowels and Lack of Appetite during the Menstrual Period.*—The patient, a married lady 28 years of age, mother of two children, suffering from laceration of the cervix, metritis, endometritis, and chronic perimetritis; complains of looseness of the bowels with bad taste in the mouth, and lack of appetite during the entire menstrual period, from the second or third day before the appearance of the flow to twenty-four or thirty-six hours after its cessation. In this case also the symptoms yielded to uterine treatment solely, as was clearly demonstrated, since, for experimental purposes, no gastric or constitutional medication was resorted to, and the symptoms disappeared with improvement of the uterine disease upon local treatment alone.

It is only in the menstrual and pathological neuroses that we can so positively prove their reflex nature: the perversion of appetite and other gastric symptoms accompanying pregnancy we know only as concomitants of that condition, and not positively as reflexes, since we cannot always demonstrate their real nature: it is by abortion, the

inauguration of premature labor, only that this is done, and when accomplished affords indeed a striking proof. With mathematical exactness the most violent gastric symptoms cease in fifteen minutes, either with the dilatation of the cervical canal and the internal os by the dilator or sponge tent or after expulsion of the uterine contents. The remedy is far too severe to be recommended for general adoption, but when premature labor was inaugurated for other causes I have repeatedly observed the sudden cessation of such gastric neuroses.

The most available method of treatment when the physician has assured himself that the reflex is purely physiological, and not due to a tangible pathological cause, an erosion, a laceration, or similar lesion, is by sedatives administered internally or by the sedative action of galvanism upon uterine or gastric fibres.

(*c*) *Gastric Neurosis of Pregnancy.*—Unfortunately, the dependence of nausea and vomiting, the morning sickness of pregnancy, upon pathological or physiological conditions of the uterus, though theoretically acknowledged, is not practically accepted; and, notwithstanding the vast literature of the subject, notwithstanding the clear demonstration of the reflex character of those symptoms, the perverse treatment of earlier days is still persisted in, and the stomach is treated until the emaciated sufferer, after months of agony, is at death's door, when premature labor is inaugurated—often too late, however, to save life. If the determining cause is to be sought in the physiological congestion, it is possible that relief is to be obtained only by evacuation of the uterus; but if the gastric reflex is in response to a pathological change or its exacerbation by the physiological congestion, relief is readily obtained by local treatment, usually simple in its nature. That the nausea and vomiting of pregnancy is a reflex symptom is too well known to be in need of discussion or proof, and it seems indeed strange that it has as yet been impossible to establish a correct therapy and to do away with the totally irrational treatment by internal medication —the direct treatment of the gastric symptom—which appears to emanate from an ignorance of the true state of affairs. Whilst there is no objection to the giving of light sedatives, such as bitter-almond water or bromide of potassium, from which relief may be experienced, a cure can be expected with certainty only by treatment of the causative uterine condition.

It seems almost a parody upon the advanced state of modern medicine to see eminent authors still advising the let-alone treatment, conscious of the utter inefficiency of medication. They urge an expectant course unless the symptoms should threaten to become dangerous in their severity. Is this rational? Is it the course to be recommended in other maladies? I would strongly urge that the morning sickness of pregnancy, however light in its character, should be

relieved in its early stages. Mild sedative gastric medication may be attempted, but relief, speedy and certain, can be attained only by uterine treatment, which may be aided by gastric sedatives. The existing conditions must be noted, and any morbid deviations at once corrected, as it is impossible to say precisely from which particular condition the morbid stimulus emanates. A congestion of the cervix may be relieved by scarification; an erosion by a sedative or astringent application, an endocervicitis likewise; friction of the congested cervix against the vaginal walls, the floor of the pelvis, or the sacrum, by the elastic tampon; an astringent tampon may serve to contract the tissues. The dilatation of the cervical canal, at one time so highly recommended, should be one of the last resorts; and when all else fails the inauguration of premature labor is indicated, and the physician should never hesitate, as a life is at stake.

A rational course should be pursued, and our treatment should be consistent with our diagnosis, as is so clearly demonstrated by any and every one of the many cases of reflex neuroses here recorded. The morbid symptoms yield only to proper treatment of the causative morbid conditions from which the reflex impulse emanates.

2. *Hystero-neuroses of the Intestine.*—Flatulence, constipation, and diarrhœa may appear in response to uterine changes: on the one hand, the splanchnic nerves, coming from the sympathetic, may check or retard intestinal action, and on the other an influence more or less active is exerted by the glandular secretions under control of the vasomotor nerves, which answer so readily to genital changes. Whether diarrhœa is due to a hypersecretion of the intestinal glands or to an increased peristaltic action, as constipation is to muscular relaxation, I cannot say. Flatulence, and often distressing distension of the bowels, without diarrhœa or constipation, which appears in response to uterine lesions, may be likened to the most common of the menstrual neuroses of the stomach, the gastric distension. Flatulence or distension of the bowels may accompany uterine disease or appear as a physiological neurosis during menstruation, pregnancy, or the menopause. While I have observed violent diarrhœas during puberty, the most common intestinal neurosis, next to abdominal distension, is the diarrhœa, less frequently constipation, accompanying menstruation.

Case XXXVII. *Reflex Intestinal Neurosis of Puberty.*—Miss H——, aged 15, under treatment for vesical weakness, is suffering from nervous prostration, probably due to rapid growth during this time of physiological functional development. The patient had been afflicted with habitual constipation, which yielded but slowly to treatment, for a few days before the appearance of the first flow. I believed that a natural action of the bowels had been accomplished and a healthy tone restored; the constipation seemed overcome. After the cessation of

the flow previously existing conditions were re-established. With the advent of the second menstrual period the patient was seized with a diarrhœa uncontrollable at times, so that I found her in tears from mortification at her distressing state: one passage followed another. This annoying reflex persisted during the two days previous to the flow, yielding to constipation during its continuance, and returning again for thirty-six hours after cessation of the menses. The third period was accompanied by the same symptoms, together with other reflexes, of which we shall speak hereafter.

Precisely the same condition was observed in the case of Miss B——, diarrhœa a few days before the catamenia yielding to the pre-existing constipation during the flow, with a return of the diarrhœa for two days after its cessation: costive during the intermenstrual period. This neurosis seemed to alternate with the pharyngeal neurosis: as the latter improved the former was intensified, both finally disappearing with treatment. This peculiar alternation of reflex symptoms I have repeatedly observed in patients suffering at the same time from gastric and bronchial neuroses, one growing worse as the other improved, always in inverse ratio. During the complete cessation of one the other was most intense. Our lamented friend, Dr. Albert Smith of Philadelphia, related to me several cases of diarrhœa and profuse mucous discharge from the bowel accompanying menstrual congestion in patients suffering from uterine disease.

Diarrhœa is by far more frequent as a reflex symptom than constipation. I have observed a violent diarrhœa during labor coming on with dilatation of the os, and ceasing suddenly with delivery. Constipation may occur, like diarrhœa, as a menstrual neurosis, with the uterine congestion. In all cases but the first mentioned, where the symptoms were not such as to warrant uterine treatment, the intestinal neurosis has responded promptly to uterine treatment, and with an improvement of the local condition the reflex symptoms have ceased. The same is true of flatulence and distension of the bowel when existing as genito-reflex neuroses.

Case XXXVIII. *Hystero-neurosis of the Intestines (Bronchial Hystero-neurosis, Case XXVII.); Painful Menstrual Intestinal Neurosis; Localized Flatulence; Disappearance upon Treatment of the Uterine Disease.*—Perhaps even more distressing than the bronchial neurosis was a localized flatulence which preceded the appearance of the catamenia, passing away, like the bronchial neurosis, with the improvement of the uterine condition after treatment. With the appearance of the menstrual congestion came a flatulent distension of the left side, causing great pain, apparently by pressure: to the left of the stomach the abdomen appeared distended, tympanitic as if by a collection of gas either in the duodenum or at the juncture of transverse and descending

colons. So painful was this distension, which emitted a crackling sound, that the patient pressed her hand upon the part in agony, endeavoring with pressure and friction "to force the wind out," as she stated, pressing it to the right, and as it escaped relief was afforded. Medication had of course been repeatedly attempted by others for this agonizing pain, which had returned with each menstrual period for almost a year, but without success, narcotics only affording temporary relief, but after the inauguration of proper uterine treatment it soon ceased like other reflex symptoms.

V. Hystero-neuroses of the Eye.

Notwithstanding the frequency of ophthalmic symptoms in connection with uterine disease, the definite causative and positive relation of these symptoms is by no means as yet well established: while it appears simple to determine their true nature, whether merely reflex or due to structural changes, by means of the ophthalmoscope, and by a tentative treatment if the ophthalmoscope reveals no morbid lesion, we are still greatly in the dark, strange as it may seem, since no organ is so clearly revealed to us as the eye, and in no organ are inflammations and morbid lesions so readily detected.

Whilst we know that patients afflicted with chronic pelvic disease usually complain of weak eyes or impaired vision, the relation of these conditions to each other is by no means well established: cases of ophthalmic disease are related as dependent upon uterine lesions (even by Mackenzie and Mayer, also by Von Graefe) which show a certain connection between the diseases of the eye and of the womb, but no reflex relationship: they are not neuroses, but cases of actual amblyopia in connection with amenorrhœa and dysmenorrhœa, caused by extravasation of blood into the retina during intense cerebral and pulmonary congestion, depending upon the retention of the menstrual flow. So also may we exclude those cases of amaurosis during pregnancy and lactation which are indirectly due to changes in the sexual organs, as they are found in connection with albuminuria and accompanied by actual lesions of the optic nerve.

The observing gynecologist will almost expect to hear patients suffering from chronic uterine disease, especially endometritis, metritis, and perimetritis, complain of weakness of the eyes, dimness of vision, or *mouches volantes;* and oculists assure me that the great majority of cases of asthenopia are found in females, many of them suffering from menstrual irregularities; yet, while tonics are given and an effort is made to invigorate the system, the ophthalmic lesions are treated as such without reference to the causative uterine lesions. Occasionally a patient is sent me by an oculist, usually one whom he has treated in

vain for a long period of time, and by reason of the failure of proper treatment in producing the expected result he supposes the lesion to be reflex in its nature, so indistinct is this relation as yet.

Ophthalmic symptoms, especially amblyopia, which need not be referred directly to a uterine condition, may occur in hysterical patients; but when transitory amaurosis or amblyopia appears at the menstrual period, the same symptoms recurring each month, we may look upon this as an hystero-neurosis, though the direct dependence can be proved only by the disappearance of the amaurosis upon the treatment of the existing uterine lesion. Decrease in the power of vision, dimness of sight as if from a cloud flitting before the eye, and *mouches volantes* occur both as menstrual and pathological neuroses, and are then relieved by treatment of the uterine disease, without interference of any kind with the ophthalmic lesion. Clement Meyer relates the case of a maiden lady aged 40 in whom the menstrual flow is ushered in by an amaurosis of several hours' duration, which disappears as suddenly as it comes, but is never accompanied by any of the symptoms of cerebral congestion —evidently a menstrual reflex, which would have yielded to proper uterine treatment.

In all cases of true reflex neuroses no structural changes exist, in the early stages at least, and the ophthalmoscope will reveal an absolutely healthy condition of the eye; but after a duration of years the disease heretofore simulated may develop in place of the phantom: in no organ is the persistent continuance of a reflex so liable to result in actual changes as in the eye.

Characteristic cases are those related to me by Dr. Barker, and reported in an earlier paper: hyperinvolution after a second confinement in a lady 30 years of age, with a cessation of menstruation, was accompanied by a severe pain in the eyes and dimness of vision. Careful examination by Drs. Agnew and Noyes failed to discover any pathological changes, and after successful treatment of the hyperinvolution by laminaria and sponge tents, later by galvanism, the menstrual flow was re-established, the uterus restored to its normal size, and, with the removal of the morbid condition of the uterus, the trouble of the eyes disappeared.

In another case, that of an unmarried lady 38 years of age, who consulted Dr. Barker on account of the severe headaches which had existed for four years, vision was impaired so that she could neither read nor write and could distinguish persons but very imperfectly: for a period of a few days in each month the headaches were even more intense and the patient suffered from diarrhœa and nausea—menstrual hystero-neuroses of the intestines and stomach. Examination revealed certain uterine inflammations: hot douches were ordered, sponge tents inserted, and leeches applied to the cervix at the time of the monthly

exacerbation. With the return of the flow the headaches disappeared; sight was entirely restored without resorting to any treatment whatsoever for the eye; and this has remained in a perfectly healthy condition ever since, now nine years, menstruation remaining normal, while in former years treatment of the eye had been vainly tried again and again by the ablest specialists. I have seen dimness of vision—never excessive, but frequently so as to prevent the patient's reading—*mouches volantes*, and the appearance of clouds, both as pathological and menstrual neuroses, frequently one eye only being affected, always upon the side of the most intense pelvic disease.

The lighter forms of ophthalmic disease which appear in response to uterine lesions yield but slowly with improvement of the causative disease if treatment is not inaugurated until after they have existed for some time; and it is only the more violent and rapidly-developing symptoms which respond as readily to uterine treatment as do the other reflex neuroses. It has appeared to me that the ophthalmic reflexes are much more persistent and yield more slowly than those on the part of any other organ; and if they have persisted for years they are very liable to result in structural changes and disease proper of the eye; which is not the case with other reflexes. This view is confirmed by the statement of one of our most able oculists, my esteemed friend Dr. Michel, who informs me that asthenopia, though first developed as a reflex symptom in response to uterine disease, is very liable to result in structural changes even though the causative lesion be overcome after short duration. This one reflex yields only to uterine treatment when quite recent in its origin. I have been unable to refer certain ophthalmic symptoms to individual uterine or ovarian affections, and hence I will only quote the statement of Rampoldi of Pavia,[1] who groups these various symptoms very positively, and refers each to a distinct pelvic disease. According to Rampoldi, these five groups of sexual diseases which affect the eye are as follows:

1. Hysteria and chronic perimetritis, he states, are causative of asthenopia, retinal hyperæsthesia, rarely of ptosis or anæsthesia of the retina.

2. Menstrual disorders: amenorrhœa he believes is causative of conjunctivitis, keratitis, iritis, and phlyctænia. To suppression of the menses he refers disease of the choroid, together with neuritis and retinitis, and says that they can only be improved after reappearance of the menses. The tendency to glaucoma is known to accompany a sudden suppression.

3. Inflammatory diseases result in hyperæsthesia and neuralgias of the trigeminus, protracted forms of iritis serosa, and sclerosis.

4. Pregnancy causes the difficulties accompanying the albuminuria

[1] *Annales universelles de Médecine*, September, 1881.

of pregnancy; amblyopia and amaurosis have been common from three to fourteen days after hemorrhage.

5. Lactation and the puerperium cause panophthalmitis and many diseases resulting from weakness and debility, ulcers of the cornea, retinitis, retinal hyperæsthesia, photophobia, and disturbance of accommodation.

I cite these diseases, which are here considered as cause and effect, but, though they may be so, certainly but few are reflex neuroses; and though Rampoldi has observed in individual cases these ophthalmic lesions in connection with the pelvic affections mentioned, I do not believe that any such positive relationship of individual phases of uterine disease to ophthalmic lesions can ever be established.

Case XXXIX. *Pathological Genito-reflex Ophthalmic Neurosis; Glaucoma, apparently resulting from Uterine Disease, appearing with Structural Changes after long duration.*—Mrs. H——, 40 years of age, has suffered for the last fifteen years from the results of laceration of cervix and perineum, with consequent descensus, subinvolution, metritis, and left perimetritis. Had been under treatment, had even been subjected to operation, without benefit: after coming under my care improved slowly under treatment preparatory to operation. While she was hesitating with regard to the time of operation after the inflammatory symptoms had been reduced, violent exertion caused an exacerbation of the cellulitis in the left side, and household cares have since then, for the past year, prevented persistent treatment. Since that time she began to suffer from pain and weakness in the left eye, which always yielded to improvement in the uterine condition, and, though intense, was usually relieved by the application of electricity to the uterus; however, the change, moving into a large new house, necessitated physical exertion and was accompanied by a good deal of excitement, and at that time the ophthalmic pain grew intense, recurring periodically at nine or ten o'clock each night. I now referred Mrs. H—— to my friend Dr. Michel, who was unable to detect all the characteristic marks of glaucoma, and yet took the case to be such, and not a pure reflex, from certain structural changes, though in the first place the symptoms may have been aroused in response to uterine irritation. This case is one of those in which structural changes seem to have followed the simple reflex symptom, the phantom to have yielded to the disease.

Case XL. *Ophthalmic Reflex; Photophobia, alternating with Dimness of Vision, mainly in the Left Eye; Retroversion, Endometritis, and Left Cellulitis.*—Miss B. M——, aged 21, subject to neuralgic headaches, was prostrated by undue physical exertion and afflicted with a displacement of the uterus and periuterine inflammation. Patient improved under treatment, but fright and exertion, running to avoid a herd of cattle dashing through the street, caused an exacerbation of

the cellulitis, while under intense mental strain, caused by annoying family circumstances, the dimness of vision which had heretofore existed, and had greatly improved with the improvement of the uterine disease by treatment, now returned, and added to this was a violent photophobia, at times accompanied by intense pain in the eye. Rest, poultices, and the hot douche brought about an improvement in the uterine condition and a disappearance of the photophobia. The haziness and dimness of vision will, I trust, again yield as soon as treatment can be resumed.

Case XLI. *Weakness of the Eyes; Dimness of Vision; Laceration of the Cervix; Operation; Cure.*—Patient, Mrs. R——, was referred to me by an oculist after an unsuccessful treatment for several months at a time during the past year. The reflex nature of the ophthalmic disease had been suggested to the physician by the complete failure of treatment in the comparatively simple case. The uterus was enlarged, retroverted, the cervix lacerated, the lips everted and eroded. After a brief treatment the operation was performed: during convalescence reading was prohibited, which was the only precaution taken and the only advice given in regard to the ophthalmic trouble; her sight at once improved, her eyes gained strength, and progress was such that all symptoms disappeared in a month after operation.

Case XLII. *Menstrual Weakness of the Eyes.*—Miss H——, who had never before suffered from her eyes, complained, upon the appearance of the first menstrual period with the advent of puberty, of a weakness of the eye and an irritation of the lids in the outer angle, a small crust appearing in the corner which felt sore, so that she could not well open her eyes. This symptom appeared for the first time with the advent of the catamenia, and has returned now for the fourth time with each menstrual period, coming shortly before the flow and disappearing with its cessation. As but little suffering was experienced, no examination was made, and I have attempted to approximate a healthy functional activity by the precautionary measures adopted—avoidance of exposure, regulation of bowels, warmth, and rest in bed during the period.

Case XLIII. *Mouches volantes; Pain and Weakness of the Eyes, especially the Left, corresponding to the Left Cellulitis.*—Mrs. S——, 28 years of age, married three years, sterile, had been under treatment for a supposed uterine tumor which proved to be a periuterine deposit. With the aggravation of symptoms by misdirected treatment her eyes began to fail, until she was no longer able to read on account of the dimness of vision and the intense pain, at times black specks floating in the line of vision. The disease had existed nearly two years when she first came under my care, and an endometritis had developed in the displaced uterus, which was fixed in a position of retroversion with the

fundus in the left side. At home she was not under the most favorable circumstances, and improvement was exceedingly slow: unable to work, unable to read, her condition was a trying one; but her eyes were not alone weak: they troubled her so that I referred her to an oculist, in hopes that something could be done contrary to my own expectations. No structural changes were detected; still, an independent treatment was inaugurated: the use of weak glasses for a short time each day, tonics and local applications gave no appreciable relief, and improvement did not take place until a decided amelioration of the pelvic trouble had been obtained. Finally, with the improvement in the uterine and circumuterine inflammation her eyesight improved.

The direct relation of ophthalmic symptoms to the pelvic disease in this case was marked not only by its coming and going with the development and cure of the uterine inflammation, the negative results of local examination and treatment, but also by the effect of certain pelvic applications upon the eye: an application of iodine to the uterine cavity or the application of a tampon of iodized cotton to the cervix caused a burning, a reflex neurotic symptom, in the left side of the head and in the ball of the eye, with a feeling, as she expressed it, as if the eye was being pushed out. Within fifteen minutes after the application of the iodine to the uterine cavity this postophthalmic pain and this feeling of distension, pushing out of the eye, come on, and continue until the iodine effect passes off. This reflex appeared so strange that I repeatedly made the application to test the correctness of the observation, and often unbeknown to her; the same symptoms, however, appeared each time, whilst no other uterine or intra-uterine application produced any unusual results.

Amblyopia with complete amaurosis may occur in the healthy eye as a well-marked reflex; and these symptoms respond as readily as the less threatening neuroses to every vacillation of the causative uterine ailment; thus I recall the case of a young lady 24 years of age, suffering from endometritis, cellulitis, and amenorrhœa, in whom an amblyopia followed by amaurosis appeared with an exacerbation of the uterine disease, which was always improved by uterine treatment. No structural changes having been detected by ophthalmoscopic examination, no local treatment whatsoever was resorted to. As the patient is not a resident of the city, I have not been able to treat her continuously, but whenever it was possible for her to come to the city and place herself under my care for three or four weeks her eyesight was always improved, as were the direct pelvic symptoms, a cure being out of the question on account of existing pulmonary trouble.

The eye is perhaps the most important organ for the study of the reflex neuroses. Since the ophthalmoscope so readily detects even the most delicate structural changes, we can draw the line between struc-

tural changes and reflex symptoms, not alone by the practical test of treatment applied to the causative disease of the uterus, but also by observation of the condition of the eye itself: by a harmonious co-operation of gynecologist and ophthalmologist the true nature of these puzzling and deceptive symptoms may be determined in this transparent organ, and the disease distinguished from its phantom. It is possible that by the aid of the ophthalmoscope we may learn to trace to their true source those confusing symptoms in which structural changes—disease proper—secondary pathological changes, or sympathetic lesions and purely reflex symptoms, converge: symptoms precisely alike to the superficial observer may exist as disease accompanying uterine changes, and independent of these they may result from the congestion or the increased quantity of blood due to the stimulation of the circulatory system by pregnancy—as resultants, we might say, of the uterine congestion; or they may appear as simple reflexes without any structural changes whatsoever: this the ophthalmoscope must determine and gynecological treatment must prove. The true cause of ophthalmic symptoms once recognized, the study of those emanating from other organs will be, to say the least, greatly facilitated. Barnes, in the paper already referred to,[1] says: "Certainly the eye in pregnancy supplies many most interesting facts, which are of the utmost value in extending and controlling the conclusions derived from other sources of investigation; for example, amaurosis is generally connected with structural change or degeneration of the retina, but there is a form of amaurosis not seldom associated with albuminuric eclampsia which may end in complete recovery."

I have seen such cases, and one has been recorded in the *Archives de Tocologie*, 1876. On the other hand, the lesion thus arising is in some cases permanent; and in these cases we may see the disease manufactured quickly under conditions more simple, more precisely defined, therefore more instructive, than under any other circumstances: in other words, the amaurosis of pregnancy may occur as a simple reflex in response to uterine distension and engorgement, or it may appear as a resultant of renal disease caused by pressure of the enlarged uterus or by renal congestion.

VI. Hystero-neuroses of the Joints.

While hystero-neuroses of the joints are not frequent, they are extremely annoying, and many most puzzling reflex symptoms due to uterine disease, some of the so-called hysterical joints, are undoubtedly true hystero-neuroses. While all possible treatment is vainly tried, a careful examination of the reproductive organs would undoubtedly

[1] *Transactions of the American Gynecological Society*, vol. i. p. 150.

reveal morbid changes of some kind, and their proper treatment would readily relieve the heretofore unmanageable symptom. Professor Erb in the twelfth volume of *Ziemssen* has an excellent article on neuroses of the joints, but he barely refers to such as are distinctly due to uterine disease. Unfortunately, their reflex symptoms are still confounded with those due to so-called hysteria. The articular reflex symptoms which may be confounded with disease proper I have seen mainly in the hip and knee, less frequently in ankles and wrists. So deceptive is this neurosis that I recollect one case of a young girl at puberty who was brought to my father for examination in the early years of my practice. She had been seen by our prominent physicians and surgeons, had been under trying treatment for disease of the hip, but no improvement had taken place. The most careful examination, at which I assisted, failed to reveal disease, and yet the symptoms were all present. It was long before my attention had been called to these reflexes, and the later history of the case is unknown to me. Undoubtedly, it was an hystero-neurosis of puberty, as I have since observed it, yet never again so deceptive, simulating disease so perfectly, without any indication of existing pelvic trouble, as the reproductive organs were not considered in this case, the menstrual function not yet having made its appearance; yet this retarded development is, and was here, a most fruitful source of neurotic phenomena of various kinds.

Examination under chloroform will of course at once solve the mystery; and in a young girl this is the course indicated, examination of uterus and ovaries being admissible only after the reflex nature of the symptoms has been assured and constitutional treatment has proved ineffectual.

Case XLIV. *Genito-reflex Neurosis of the Knee; Laceration of the Cervix and Perineum; Endometritis; Relief after the Second Application.*—Mrs. T——, aged 41, came to me in June, 1887, on account of annoying uterine symptoms. She had been in good health and free from pelvic symptoms until after the birth of her third child, eight years ago, when she was confined for months by a severe attack of puerperal fever, which terminated in a pelvic abscess. The symptoms of uterine disease began to develop; these were increased by the next labor, one year later. Her condition grew worse, and three years ago an operation was performed upon the cervix and perineum, after which her general health improved; the local symptoms were very much lessened, but it appears that, as the patient felt well, she neglected all precautionary measures and continued in her usual course of life. Not alone did the uterine inflammation return with increased severity, but in addition to the other previously existing symptoms—backache, hypogastric pains, and pain in the top of the head—came an annoying nausea and flow of saliva from the mouth. She again sought medical advice, and

an endometritis fungosa was discovered, complicating the relapse: and to this the recently-developed reflexes, nausea and salivation, must be referred; and this supposition proved to be correct: a great amount of hypertrophied mucous membrane was removed with the curette, and immediately thereafter the nausea, vomiting, and salivary flow ceased. No after-treatment followed, and ere long a lameness of the left knee became apparent; the patient walked like one suffering from an ankylosis of the knee-joint; the pain she described as being in the joint itself, and her walk was characteristic of an articular lesion. This last operation was performed in January, 1887: the gastric reflex ceased at once, but the neurosis of the knee appeared soon after, and has been growing gradually worse ever since in proportion as the uterine symptoms increased. The curetting was well timed, and by it the cause of one reflex was removed; had a proper treatment of the uterine and periuterine inflammations followed at this opportune time, a perfect result might have been achieved; but as no further assistance was offered, and the patient herself, being relieved, of course did not demand it, only one of the various morbid conditions was removed.

The patient came to me May 31, 1887. I found a deep laceration of cervix and perineum, the uterus very low, enlarged, the cavity wide, an active endometritis, a deep cervical laceration, mainly to the left, with a left chronic periuterine inflammation and an induration of the tissues, probably referable to the cellulitis in the puerperium eight years ago. I resorted to negative electro-cauterization of the uterus for relief of the endometritis, 40 milliampères, four minutes, platinum sound in uterus, medium plate with positive pole on abdomen: this was followed by an application of 25 per cent. carbolic acid to the endometrium, iodoform and iodine tampons to the cervix, the uterus being supported by elastic astringent tampons. The pain in the knee thereupon diminished and her walk improved. The treatment was repeated June 2d, and again June 4th. The menstrual period came on with less pain, and upon return for treatment on June 15th the pain in the knee had ceased and her walk was but little impaired. The case is instructive, as it shows well-marked reflexes of different organs, each dependent upon one distinct uterine lesion, and the correct instinct of the patient is revealed: medical advice had never been sought, as the patient had correctly diagnosed her own condition, having suffered from a gastric neurosis; and, observing the direct dependence of this symptom upon the uterine condition, she supposed the stiffness and pain in the knee-joint to originate in the same way, especially as it was worse when the pelvic pains increased. To obtain some relief at least, she had tried all possible inunctions and liniments, applications which had been recommended, but without any benefit; even blisters were used. I was surprised to see the ready yielding of the neurosis to the slight improvement in the

extensive and severe pelvic condition, and attributed the improvement to the electricity.

Case XLV. *Genito-reflex Neurosis of the Hip.*—Miss S——, a young lady of 20, has the appearance of great suffering; she complains of leucorrhœa, backache, headache, and weakness of the eyes, of great tenderness and pain in the hip, and the feeling that one leg is shorter than the other, "as if all the tendons were stretched." The pelvis is inclined to one side; she favors the afflicted limb, and her position, whether erect or reclining, is that of a person suffering with hip disease; none of the characteristic symptoms of this disease are wanting, with the exception that there is little or no pain upon direct pressure on the joint, but that the sensitive spot is above the joint, on and below the crista ilei, behind the anterior spine; pain in the knee, rotation and position of the foot, etc. are all well marked.

I was somewhat astonished to find that Miss S—— was fond of walking, and, although fatigued, would not complain of increased pain in the hip after exercise.

Dr. Sims kindly consented to see the patient with me: permission was granted, and a careful examination of the pelvic organs was made; the uterus was found normal in size and position, somewhat congested, showing erosions and marked endocervicitis. The uterine symptoms, and, as we thought, all others, were now explained: local treatment was not allowed, but by the use of tonics, astringent injections, etc. the uterine symptoms have improved, and at the same time the hip trouble has become less annoying; and I expect to overcome it entirely as soon as I shall be enabled to resort to uterine applications. Of late the reflex nature of the disease has become more apparent by exacerbation at the time of the menstrual period.

Case XLVI. *Pathological Reflex with Menstrual Exacerbation; Violent Contraction of the Joints; Laceration of the Cervix; Operation; Cure.*—Mrs. C——, aged 29, II.-para, though annoyed for years before her marriage by a persistent leucorrhœa and dysmenorrhœal pains, had never complained of pelvic weakness; in her first confinement cervix and perineum were lacerated, and the cervical tear aggravated in the second. Of nervous temperament, she became the victim of distressing reflex symptoms, suffering almost continuously from a headache, which finally culminated and centred in intense pain in the left temple. In place of the usual symptoms in the back of neck and head, pain and pressure, she had a feeling of drawing up, which caused such suffering that she was obliged to let down her hair and seek every possible means of relief. Her memory was impaired; gastric neurosis was marked—distension of the abdomen, with belching of wind and vomiting. These symptoms were greatly intensified during the menstrual period; so also was the pain in the side and across the small of the

back, which became excessive at this time. With the menstrual congestion came a blinding headache and attacks, during which she lost consciousness, marked by violent motion in all joints, a jerking of arms, kicking, so that constant watchfulness on the part of her friends was necessary to prevent injury to herself. The attacks were so severe that hypodermics of morphine were tried after milder sedatives and nervines had failed; but this morbid reflex did not abate until the giving of morphine was supplemented by chloroform and the patient had been kept under its influence for an hour or more. Local treatment, followed by improvement in the uterine condition, lessening of the discharge and of the menorrhagia, did not affect the reflex symptoms, which in no way abated.

I saw Mrs. C—— in consultation with my clinical assistant, Dr. F. C. Ameiss, the attending physician, who had repeatedly urged operation. Treatment proving unavailing, the patient finally consented, as her suffering grew unbearable, the headaches more intense and almost permanent, the menstrual exacerbations more severe. The operation was performed March 20th, and upon recovery from the anæsthetic a remarkable change was noticeable: the patient was quiet, free from pain, her headache gone, no more nausea, not even from chloroform, and during the night natural sleep in place of the trying insomnia from which she had heretofore suffered.

The reflex nature of the symptoms in this case, and their dependence upon the laceration, were most strikingly demonstrated: in no way affected by the successful treatment of the inflammatory condition, cerebral, neurotic, gastric, and joint symptoms all disappeared with the closing of the cervical tear. Two months after the operation the family birthday gave rise to unnecessary excitement and exertion, and in consequence a slight return of some of the previous symptoms—belching, with a slight nausea and some pain in the head. These disappeared after a day's rest, and the patient is now in the full enjoyment of health, her memory as good as ever; she sleeps well and is free from pain; a cheerful disposition has taken the place of the irritable temper which had before rendered home-life unbearable.

Whether these violent motions are properly referable to the joints or to the spinal nerves I will not decide.

Case XLVII. *Pain in the Ankles from Persistent Irritation of the Uterine Fibrils after Removal of Uterus and Ovaries.*—Case XVII., referred to as an example of nerve-pains in ankles and soles of the feet, incapacitated at times from walking, partially by the pain in the soles of the feet, partially by the pain in the ankle-joint, relieved by the sedative action of electricity upon the pelvic nerves.

A most peculiar neurosis, which I have only twice observed as a cracking of the joints, which has appeared as a well-marked reflex in

one instance only in a patient suffering from retroversion with metritis and endometritis, laceration of cervix and perineum, who noticed a peculiar cracking in elbow- and knee-joints on the right side, upon which the most severe pelvic symptoms existed. These symptoms yielded to improvement in the uterine condition upon local treatment after having continued for a twelvemonth.

In the following case I was not able to positively demonstrate the reflex nature, but relate the history as one of the most striking on record:

Case XLVIII. *Cracking of the Joints, with Hystero-neuroses of Stomach, Heart, Eyes, and Breast; Metritis, Endometritis, and Perimetritis; with some improvement in the pelvic disease after energetic treatment, the symptoms diminished in intensity.*—Mrs. Dr. L—— is afflicted with severe pelvic disease brought about by exposure to cold, by being driven from her home by fire on a winter's night while the ground was covered with snow: all the pelvic viscera are affected; the uterine canal is tortuous, adhesions forcing the organ to right and left; anteflexion with lateral flexion; metritis, endometritis, chronic cellulitis; moreover, the condition is complicated by the existence of a floating kidney on the right side; nausea and vomiting are constant, mainly at night, but most distressing during the menstrual congestion, which is relieved by only a very slight show. The neurosis of the eyes is marked; the pain in the breast intense during the catamenia. While the gastric neurosis is intense even during the flow, certain of the symptoms, like the painful drawing in the back of the neck, almost resembling opisthotonos or the pain of cerebro-spinal meningitis, cease with the appearance of the bloody discharge.

Since the intensification of the pelvic disease the patient has observed a cracking of the joints so marked that in walking up stairs the cracking of the knee-joint is audible some yards, and the same sound can be heard in elbows and wrists; even motion of the eyelids during exacerbation of the symptoms produces a crackling sound. The uterine and ovarian disease being so intense and of so long standing, I was unable to attain much improvement, and suggested oöphorectomy as the only possible means of relief. This was not acceded to, and, as the improvement was but slight, I cannot positively refer the cracking of the joints to the pelvic disease, but believe it to be a reflex symptom, as it was proven to be in the case before mentioned, in which it existed, however, in a very slight degree.

The stiffness of the leg which occasionally appears as a concomitant of cellulitis or ovarian inflammation, and which may present the characteristics of a reflex hystero-neurosis, must not be mistaken for the same, as it is usually directly due to pressure upon the main tract of the nerve or vessel by the displaced or enlarged viscera, and often by a

pathological mass in the side of the pelvis; hence we find this stiffness always upon the same side with an existing cellulitis, ovaritis, or neoplasm. A case in point is that of a lady now under treatment suffering from trying cerebral reflexes, but at present very much weakened by a cellulitis brought about by misdirected treatment at her home. The uterus is enlarged, inflamed, slightly drawn to the left side, which is the seat of a cellulitic effusion. The menstrual period is one of great suffering, and the flow is always predicted by the beginning stiffness of the left leg, which precedes its appearance by two days. The stiffness begins forty-eight hours before the catamenia, increases until it reaches its height shortly before the appearance of the flow, to pass off slowly with its cessation. The leg is constantly weak, but this weakness is greatly increased with the stiffness during the period.

VII. Dermatoses; Reflex Dermatic Neuroses.

The pigmentation of the skin during pregnancy has been one of the few symptoms generally noted which link the diseases of this large surface to the reproductive organs. So little has the direct causative relation between the morbid conditions of the skin and uterus and ovaries been suspected, so little plausible did it seem, that the remarkable and noteworthy investigations which have lately been published have received but little attention. Unquestionably, the persistency of many dermatological conditions is referable to their nature, but in some cases it is due to the fact of their being genito-reflex neuroses, and, like other reflex conditions, these are intractable, yielding only to a removal of the cause: it is perhaps more difficult to arrive at the true nature of these reflex dermatoses, as they receive but passing attention from the gynecologist, being noted only as accidental accompaniments of uterine disease; and the dermatologist, though he may suspect their dependence, is not in a condition to demonstrate this, and suspects it only from the failure in his treatment. Ten years ago I received but an unsatisfactory response to my inquiry among dermatologists. Dermatoses had indeed been observed with exacerbation during the menstrual period, occasionally appearing only during the catamenia, but their direct dependence upon uterine disease was questioned. Whilst the pigmentation of the linea alba and of the areola was recognized as an evidence of pregnancy, the sallow complexion of uterine disease and the peculiar facies of cystic degeneration of the ovary were referred to degenerated nerve-action, to imperfect circulation, to inability of the morbidly influenced centres to promote the healthy performance of nutrition, or to a reduction in the number of the blood-corpuscles. The folly of such a theory is readily recognized by the close observer, who

has seen the sudden change of complexion after an operation upon the cervix or after the removal of a diseased ovary. Even while the patient is still in bed, before recovery has taken place, the sallow complexion of disease has yielded to a fresh, healthy appearance. 'It is a true neurosis, but the genito-reflex neuroses of the skin differ from all others in the fact that they represent actual change, the disease and not the phantom; thus we have pigmentation, pustules, acne, erythema, in no way differing from the disease proper, which yield to treatment of a causative uterine disease or appear only with its exacerbation during the menstrual period, but prove intractable to local medication. I speak of them as dermatoses, as neuroses of the skin, because we may so most readily classify them. They are equally referable to the circulatory and glandular systems, as they are, in fact, the result of vascular changes, and must be traced to the vaso-motor nerves; hence they resemble the symptoms which I have considered as vascular, the flushes, sweats, etc. The vaso-motor nerves, by their direct connection with the uterine fibres and ganglia, must serve to explain these peculiar symptoms, which are in fact dermatoses dependent upon pathological and physiological changes in the reproductive organs, rather than simply reflex nerve-symptoms, simulating disease without the structural changes of disease proper.

Tilt finds prurigo and eczema in intractable and recurring forms during the menopause. Others have observed the frequency of erysipelas at this period, recurring frequently during two years until perfect cessation even after long intervals, to cease entirely with an attack five years later. Erasmus Wilson does not consider women very liable to cutaneous disease at the menopause, though he believes these obstinate if they do occur. Unquestionably, we have equal if not more reason for these reflex symptoms during the entire menstrual life of woman than at this particular period. Acne rosacea, lichen, pruritus pudendi, nettle-rash, have been observed during the menopause in patients never before afflicted with cutaneous disease; but how little the true nature of the reflex neuroses has been appreciated is evident from the constant placing side by side of coexisting or resulting diseases with the reflexes. Alibert has observed a cutaneous eruption in a patient during the menopause who had been afflicted with the same eruption during puberty, and who had been free from any similar affection during the entire intervening period of her life—a recurring reflex precisely as I have described it in other organs. Behrend in his work on diseases of the skin has more fully recognized the reflex nature of certain dermatoses than any other author hitherto, and yet he appears to regard them, as he distinctly states, rather as symptoms of the same morbid condition, and is extremely incredulous as regards their true reflex nature, looking upon them in part as a vica-

rious menstruation; but he honestly states that he has not as yet been able to determine the precise relationship between the cutaneous and uterine conditions. He has most correctly observed the frequency of eruptions during periods of pathological change in the uterus, and says "that it is a well-known fact that many of the sexual changes in woman are accompanied by morbid conditions of the skin—that they appear together with disease of the uterus and its annexa or with physiological changes." It is not uncommon to see women afflicted with metritis, oöphoritis, and uterine displacement suffering from persistent eczemata or urticaria which does not disappear until the uterine irritation subsides or the displacement of the uterus is relieved; so also irritation of the uterus by pessaries or applications causes such eruptions. Most common, however, is the pigmentation, especially in the face, as a concomitant of chronic uterine disease or neoplasm. The same dermatoses are also observed, together with physiological changes, in the reproductive organs, but, as he truly says, gynecologists have not yet paid sufficient attention to these cases, and he himself is not in a position to give a plausible explanation of the relationship between diseases of the skin and the genitalia; hence he has confined himself to a description of those diseases of the skin which accompany menstruation, and has classed them with the eruptions resulting from medication and vaccination, though he concedes that there is no kinship. According to his statement, puberty and the advent of menstruation are marked by seborrhœa, the appearance of acne and comedones in the face. This is so common that the inauguration of sexual life is predicted from the appearance of these symptoms; yet he is in doubt as to a direct relationship on account of the appearance of similar diseases in men, and the fact that an acne appearing in a girl at this period may continue unchanged for years. The causal relation is better marked, Behrend continues, in eruptions which appear a few days before the menstrual period, disappearing spontaneously with its cessation. This is more especially the case during the first menstrual periods: at times they return later in life with the catamenia. That the dermatoses which he has observed and believes to be dependent upon uterine changes are strictly reflex symptoms is proven by the following typical description: They begin several days before the appearance of the flow, and vanish spontaneously as it ceases or a few days thereafter, but return regularly with each period, so that the coming of the flow can always be predicted by the appearance of the eruption. This is the best evidence of a reflex neurosis, and characteristic of a causal relation, as the menstrual neurosis almost invariably bears this same temporal relation to the hemorrhagic flow.

Behrend has well described another peculiarity of these menstrual

dermatoses—their localized or isolated appearance. A single pustule develops with the coming of the menstrual congestion; a single red spot upon chin or cheek, upon the thigh or any part of the body; thus in one patient a single acne-pustule was observed which appeared at different times in different places, sometimes upon the knee, sometimes upon the elbow or chin, not the slightest evidence of a second pustule being anywhere observable. Erythema he has observed in the same way, and cites an erythema multiforme and a herpes iris continuing for a period of eight or ten days during the catamenia. Lailler, Steller, and Schramm describe such cases. Herpes and ecchymoses are related by Bartholemius and Steller; hemorrhagic nodules by Wilhelm; diffuse inflammatory dermatoses of an erysipelatous character by Behier, Greletti, Wagner, and Pauli. These inflammations are occasionally accompanied by œdema and followed by desquamation. In France this is known as the *érysipèle cataménal*, and was formerly confounded with true erysipelas. Behrend tells us that these dermatoses are occasionally concomitants of menstrual disorders, displacements, or catarrhal conditions, but frequently without marked disease (undoubtedly an erroneous statement, the result of imperfect examination). At times the causative connection is distinguished, as in the case cited by Schramm: A lady 36 years of age, formerly regular, became the subject of a uterine catarrh in consequence of a cold; this was followed by a cutaneous eruption, which, notwithstanding its repeated recurrence, steadily diminished with the improvement of the uterine disease in consequence of local treatment. In all cases observed by Behrend the recurrence of the menstrual dermatoses was temporarily checked during pregnancy. Collard relates the case of a young Norwegian in whom the first appearance of menstruation was accompanied by red spots, probably petechiæ, over the entire body; the administration of sudorifics was followed by hemorrhagic perspiration, and these symptoms recurred regularly for several months with each period. Conception taking place immediately after marriage, menstruation ceased, and with it the cutaneous symptoms, which have never returned. In other cases which have been observed the eruption returned after confinement. He seeks the cause in certain unknown constitutional changes which take place in the system during the menstrual period or during pregnancy. While this may be true of the dermatoses of pregnancy, even of menstruation, of puberty, and the menopause, it is certainly not true of those accompanying a slight uterine or ovarian disease; and I must consider them as true reflex nervous symptoms directly dependent upon the morbid or physiological changes in the reproductive organs, but determined by nerve-influence and not by constitutional changes.

Striking cases have of late been recorded in medical literature,

among them the erythema uterium cited by Kidd;[1] menstrual erythema by Pauley[2] and by Joseph Beziehung.[3]

Among the most common of the dermatoses I may cite the acne of puberty, flushes, sweats, and seborrhœa, which give truth to the statement of Tilt that the skin is the safety-valve of the system. The eczematous eruption of the auricle and directly behind the ear I have observed twice at this period as menstrual neuroses. I have seen the appearance of a single red spot or a single pustule, a herpes—the latter especially on the lip and on the vulva—coming, like all menstrual neuroses, two or three days before the appearance of the flow, to pass away with its cessation. The more common pathological neuroses are the erysipelatous inflammation of the face, petechiæ, pigmentation and nodules over the skin, discolorations, and a sallow complexion. The pigmentation of pregnancy is so common, and its cause so well recognized, that it need hardly be mentioned. Generally known and recognized as dependent in some way upon genital changes in women are the acne of puberty, the pigmentation of pregnancy and disease, the sallow complexion of uterine and ovarian disease: less generally known is the herpes upon lip or vulva, which is a marked indication of genital disorders. Pigmentation, so uniformly looked for in pregnancy that it is one of the most certain signs, is likewise a frequent accompaniment of uterine and ovarian disease, and yet I will by no means insist that it is always a direct reflex neurosis, as no one symptom is more liable to appear in response to the changed condition of the nervous and circulatory systems, and pigmentation is dependent upon both, and may result as well directly from morbid states of these important systems; but dominating all blood-distribution and all secretions is nerve-power (Barnes), and the irritation of the important nerve-centres arising from morbid stimulus of uterine fibres may determine such results as well. As authorities have been rather inclined to associate secondary conditions with the more directly related and easily explained causative states, so pigmentation, which is so readily determined by conditions of the blood, is referred by most investigators to this cause.

That the pigmentation which accompanies physiological and pathological changes in the uterus is caused by perverted nerve-action is evident by the peculiarity of this pigmentation, almost invariably symmetrical as it is, so well characterized by the butterfly of pregnancy or disease. So it is argued by Barnes, who cites the case related by Dr. Godson in the *London Obstetrical Transactions* of a girl eighteen years

[1] *Proceedings Dublin Obstetrical Society*, April, 1880.

[2] *Berliner klin. Wochenschrift*, 1880, No. 45.

[3] "Der Dermatosen zu den Genital Erkrankungen des Weibes," *Berliner klin. Wochenschrift*, 1881, No. 37.

of age sent to St. Bartholomew's Hospital for chorea in the seventh month of pregnancy: the girl exhibited a characteristic dark pigmentation of the areolæ of both breasts, leaving the areolæ for about one-third perfectly free from discoloration. This area was almost exactly symmetrical in the two sides; it was sharply limited, and, as Barnes justly says, it is inconceivable that any difference in the quality of the blood going to the part could exist. Such cases are not uncommon, but they have escaped observation, as parts of the body are often implicated which are concealed by the clothing or bedding, and, as neither pain nor pruritus is caused, the patient herself does not call the attention of the physician to her condition; the pigmentation of the face is better known, as this must be noticed by the most superficial observer, and vanity forces the patient to seek relief.

It is upon the larger surfaces of the body that the striking characteristics of this genito-reflex neurosis are most fully developed; the most peculiar configurations are traced, with perfect symmetry, precisely alike on both sides. It is needless to describe cases, as no two are alike, yet all coincide in their origin and symmetrical appearance as a rule; thus, the case of a patient recently seen in whom pigmentation of the forearm began during pregnancy, and was developed and intensified by a cellulitis during the puerperium: when I saw her, during convalescence, the discoloration had already greatly diminished, but the peculiar configuration was still perfect, alike in every detail, every dot, and every ramification on both sides. In this case the course of the ulnar nerve and its radiations had evidently been followed: darkest toward the elbow, the density diminished and the pigmentation terminated in numerous branches upon the ulnar side of the back of the hand, extending around toward the palm and the flexor front of the arm near the wrist, here and there a perfectly white spot in the dark mass, on one side precisely as it was on the other; then toward the border isolated blotches of pigment.

The only possible conclusion is that this partial pigmentation and peculiar distribution were determined by nerve-influence: hence the determining cause of pigmentary deposit must, in some cases at least, be a peculiar condition of the nerves at their ultimate peripheral distribution. Morbid nerve-impulse from uterine terminals may determine such pigmentation; it is unnecessary and far-fetched to refer this phenomenon to changes in the suprarenal capsules produced by the changes of pregnancy.

Blepharo-marasma is seen in women with sclerosis of melancholia, but the pigmentation of the eyelids must be distinguished from the simple venous lividity so marked during menstruation. Among the peculiar cases cited by Barnes is one of blue discoloration in a pregnant woman, and in evidence of the striking nerve-influence the complete

blackening of the skin of a woman condemned to death by a Parisian mob and threatened with execution during menstruation: fright caused a sudden cessation of the menstrual flow; her execution being deferred for a few days, her skin became as black as that of a moderately dark negro, the joints of the fingers blacker than the other parts; she became anæmic, and died at the age of seventy-five, more than thirty-five years after the shock, the skin remaining dark until death. This was an unusually potent mental reflex, but no less intense may be the pigmentation which appears as a genital reflex: as a rule, the neurosis, like the cause, is insidious in its development and not as violent in character.

I shall cite only such cases as have occurred in my practice, and which have been proven to be neuroses by their direct dependence upon uterine and ovarian conditions.

Case XLIX.—*Sallow, Livid Complexion; Endometritis Fungosa; Profuse Menorrhagia; Operation; Cure.*—Mrs. H——, 40 years of age, suffered from profuse menstruation, menorrhagia almost to exsanguination, the result of a small submucous fibroid and an hypertrophy of the endometrium, laceration of the cervix, enlargement and descensus of the uterus. Her complexion was so striking, leather-like, sallow, that I had often observed her on the street when passing in her carriage before she came under my care. Energetic treatment with local applications or perchloride of iron bettered the condition, but failed to check the profuse flow, merely lessening it; though she lost much less blood, her complexion remained the same. Operation was then determined upon; the uterus curetted, the laceration repaired; within two days after the operation her complexion began to clear, and before she left her bed, less than ten days later, before she had gained strength, still weakened by the operation, Mrs. H—— presented a completely changed appearance; a youthful, healthy complexion, as I said to her at the time, of "milk and roses"—a complexion to be envied by a young girl in the best of health.

The above case is a striking evidence of the dependence of this livid complexion upon nerve-influence, and not upon nutrition or the blood-state; and, in fact, I have now so often observed this that I assure a patient, afflicted with such uterine disease as is susceptible of decided improvement, of a youthful appearance: especially after operation for laceration of the cervix have I seen this change, rarely as sudden as in the case above described, but always sufficiently rapid to determine the question of its origin, a healthy complexion appearing long before an improvement in nutrition and a gain in weight.

Case L. *Genito-reflex Abdominal Melasma; Retroversion, Metritis, Endometritis, with Erosion; Local Treatment; Cure.*—Mrs. X——, from the interior of Missouri, had been under treatment for the

uterine disease which had impaired her general health; but no improvement being visible, the attending physician had placed a Hodge pessary, which had cut into the cervical tissue and caused additional pain, confining patient completely to her bed. When this lady came under my care she was in a wretched condition, emaciated, debilitated, with beginning bed-sores, and I found, in addition to the ugly cervical erosion, a deep semilunar line which marked the position of the pessary: this, like the granulating cervical erosion, suppurated freely. The abdomen was absolutely black, a lighter ring about the navel, with a fading margin toward the spine of the ilium. I was told that this condition, which had caused much fright, as it was supposed the patient was mortifying, had appeared since the aggravation of her condition by the placing of the pessary. The local condition yielded rapidly to antiseptic washes, iodoform, and carbolated tampons, together with mild applications to the endometrium, and after the third or fourth application the abdomen began to pale, and when the patient returned to her home, after the second week of treatment, the surface was mottled, quite pale in places, with darker grayish-brown spots. Although her general condition had improved very much during her short stay, this perfectly black pigmentation could never have disappeared with the comparatively slight constitutional change had it not been under direct nerve-control, dependent upon the post-cervical ulceration with which it had made its appearance, and with the cure of which it vanished before any very decided constitutional change had taken place. This is one of the most striking cases of pigmentation which I have seen; the milder forms are common.

Case LI. *Genito-reflex Facial Dermatosis; Acne Rosacea; Laceration of the Cervix, Metritis, Perimetritis, Anteversion, and Descensus Uteri.*—Mrs. E——, aged 36 years, mother of five children, whom I attended in her sixth confinement, had suffered from an annoying eruption of the face which covered the nose and in part the cheeks in butterfly form: she had not been benefited by treatment either by dermatologists or general practitioners: gynecological applications had been made, I was told, but most probably in a very superficial manner, as no local or general improvement followed the uterine treatment. The slight treatment which was permitted after the confinement while I attended the patient was followed by a very marked improvement in the cutaneous disease, but, her general condition being fair, she ceased treatment as soon as she was free from suffering, before the long-existing chronic uterine disease had been relieved; hence the dermatosis was only relieved, not cured.

Case LII. *Erythematous Eruption of the Face, with Menstrual Exacerbation; Retroversion, with Metritis and Endometritis*—This long-existing and annoying dermatitis disappeared almost completely, with-

out direct interference of any kind, upon treatment directed solely toward the uterine disease; a relapse following injudicious exertion during my absence in the summer, the erythema partially returned, but yielded again, so as to be scarcely noticeable, upon the placing of a proper pessary.

CASE LIII. *Reflex Erysipelatous Inflammation of the Face improved by Gynecological Treatment; Cured by Reposition of the Uterus.*—Mrs. X——, suffering from pelvic pain, nervous and physical prostration due to hyperplasia, endometritis, and anteflexion of the enlarged uterus, was afflicted with an erysipelatous inflammation of the face which had persisted during the last two and a half years, the cutis being always in an irritated condition, showing a decidedly erysipelatous condition during the menstrual congestion. A specialist had never been consulted; no well-defined treatment had been attempted, but various popular remedies and mild applications occasionally recommended by the family attendant had been tried, always in vain. With improvement in the uterine state by treatment of the endometritis the severity of the menstrual attacks diminished, and by continuous treatment with tonic medication, but without any cutaneous applications, the dermatosis gradually faded, but a trifling evidence of the previous state appeared with the coming of the menstrual congestion. With the placing of a pessary, by which the uterine displacement was overcome, after cure of the inflammation all traces of the reflex at once disappeared, and during the last five or six years, though the patient has not consulted me, I have heard of no return, and have seen no evidence of the trouble in occasionally passing her on the street.

Bleeding from navel, from eyelids, nose, and ears at the menstrual period I have recorded among the neuroses of the circulatory system.

CASE LIV. *Acne Pustule on the Side of the Nose, recurring with each Menstrual Period; Anteflexion, Endometritis, and Perimetritis.*—Miss C——, from Texas, 26 years of age, long afflicted with vesical pains, the result of pressure of the anteflexed uterus, menstrual suffering, and great nervous depression, was much annoyed by an acne pustule which appeared for three successive menstrual periods upon one and the same place, on the right side of the nose, but ceased to come with decided improvement in both the position of the organ and the catarrhal inflammation.

CASE LV. *Vesicular (Herpetic) Eruption on the Labia; Retroversion, Descensus Uteri, Endometritis, Metritis; Cure with Reposition of the Uterus and Relief of the Inflammatory Symptoms.*—Mrs. E——, mother of several children, suffered from a number of reflex nervous symptoms—loss of vision, amblyopia, cloud before the eyes, abdominal distension, and the appearance of several herpetic vesicles upon the labia—during the menstrual period; this eruption had accompanied

the catamenia since the exacerbation of her symptoms, but ceased to make its appearance after two months of successful treatment.

It is hardly necessary to enter into the details of these cases, as it is impossible to rehearse all the numerous forms of dermatoses, as every one of them may, I believe, appear as a genito-reflex neurosis, and not in response to any one definite uterine lesion, attacking such part as is predisposed and determined in character by the condition of the system or of the tissues at the time. The red spot which has always appeared on the chin, the vesicle which has appeared upon the lip during the menstrual period, I have observed, but not for a sufficient length of time to determine the effect of uterine treatment upon the cutaneous affection. The pruritus which I have observed in two cases coming shortly after the menopause, and most inaccessible to treatment, I believe to have been a neurosis on account of its extremely persistent character: having resisted dermatological treatment for many years, it was mitigated and greatly improved by local applications combined with careful treatment of the uterine disease, which existed in both cases: a complete cure was finally effected in the one case only by galvanism, but the neurotic character of the disease was well marked by the success of the single application by which the disease which had so long resisted treatment was suddenly cured; though it again returned some weeks later in a mild form, its violence was broken. In the male, preputial herpes has been observed in distinct dependence upon ulceration of the penis.

Among the hysterical cases is that of Le Cat (Barnes), who observed a patient whose left leg became black during each pregnancy. The menstrual erythema of the thighs around the vulva I have seen as a concomitant of uterine disease, but cannot positively assert its direct reflex relation.

The formation of small tumefactions I have observed but twice: in one instance as an occasional occurrence in an extremely neurotic patient, a great sufferer from dysmenorrhœal pains; but as uterine treatment was out of the question, I was obliged to resort to the bromides, without effect, but found the action of a mild faradic current most successful in relieving the blinding headaches and overcoming the intense pains which followed the course of certain nerves; when in the arm the appearance in this extremely emaciated patient, in whom every fibre could be observed, was that of a whipcord stretched from the lower portion of the humerus to the upper portion of the forearm, over which the skin hung, the arm being slightly bent; and upon various parts of the body small tumefactions of the size of half a walnut appeared, to pass away with the cessation of the menstrual flow as rapidly as they had come. I can only regard their appearance with the coincidence of menstruation and exacerbation of the uterine dis-

ease at times of great bodily suffering and nervous excitement as indicative of their reflex nature. In the other case, which I would cite more fully, the reflex nature of the phenomenon is clearly depicted. The influence of a morbid nerve-impulse upon the development of cutaneous eruptions is apparent in some of the most common of these diseases, as the herpes zoster, which is confined to the area of a certain intercostal nerve, and the pruritus vulvæ, which has been known to return and persist even after the affected part of the skin had been completely excised (Schroeder); and, on the other hand, I have seen a most unyielding case cease upon a single application of galvanism. Herpes preputialis in the male may appear in response to urethral irritation, as in the case of emotional icterus cited under the hepatic reflexes, in which the lichen, like the jaundice, appeared either as a cerebral reflex in response to a sudden moral emotion, great fear, or to the balano-posthitis and ulceration of the penis, with the cure of which it disappeared.

Case LVI. *Genito-reflex Tumefactions of the Cutis and Subcutaneous Tissue; Menstrual Hystero-neurosis of Various Organs.*—Miss E. H——, under treatment for chronic uterine and ovarian inflammation, metritis, endometritis, anteflexion, complained less of direct pains than of the numerous reflex symptoms depending upon the pelvic disease. When the patient first came under treatment the most striking of the reflexes appeared at the time of the menstrual congestion: pains in the top of the head, in the back of the neck, with distension of the stomach, were constant; the menstrual neuroses were intense in character; the breasts became tense and painful; small tumors appeared, especially upon forehead, breast, and back; the pain in the top of the head was intense. Invariably with the nausea comes a tingling in the fingers, but she can never vomit. Nausea and tingling in the fingers always coexist. All these symptoms appear now simultaneously with the coming of the menstrual congestion: the majority have existed since the development of a catarrhal condition in the utero-vaginal tract, the result of a severe cold taken in a winter's frolic some five years ago; both local pains and reflex phenomena were mild in character, but with the aggravation of the uterine disease, brought about two years ago by the patient's slipping and falling heavily upon the ground, evidently determining or aggravating the anteflexion, the tingling in the fingers and body grew worse, and the pain in the head, which did not exist before, came on. The case is a typical one. We see a group of symptoms mild in character, appearing as functional reflexes in response to uterine and ovarian irritation, suddenly very much aggravated by the development of a new uterine status, an increase and exacerbation of the old condition. The gastric neurosis, which before this accident existed as a mere gaseous distension, developed into intense

nausea; the tingling in the fingers and other parts of the body grew worse; and the pain in the head came on as an entirely new feature in the case: all yielded to uterine treatment.

Not in certain of these dermatoses only, but in almost all, is it difficult to determine their proper status, unless by its vacillation with the improvement and exacerbation of uterine disease, independent of the condition of the system, and by the effect of gynesic therapy: even menstrual exacerbation may take place in a dermatosis not reflex in character, but secondary to, or a mere concomitant of, the uterine disease. The failure of proper dermatological treatment may lead us to suspect a reflex, and this will be proven by the disappearance of the eruption upon gynecological treatment alone.

Like other genito-reflex neuroses, the dermatoses are improved by, and may yield temporarily to, sedative medication, especially the sedative action of galvanism. It is difficult to differentiate as to the correct causative dependence of these phenomena, whether reflex or symptomatic, whether secondary or vicarious; whether incidental coincidences or resultants of the same condition, to which must be ascribed the pelvic symptoms, we are not yet in a position to determine without the aid of the unfailing test, treatment.

VIII. Mammary Hystero-neuroses; Reflex Symptoms on the Part of the Breast.

The precise position which mammary changes assume in relation to the reproductive organs is difficult to determine, on account of the close connection existing between these parts, which we might term internal and external sexual organs; and it is for this reason only that I here treat of the mammary hystero-neuroses in a separate section, distinct from the glandular reflexes, the breast being a gland so different from all others by reason of its intimate connection with the sexual organs; in fact, it is usually considered as a member of that group, and must justly be classed so, as we see all physiological phases of sexual life represented in the mammary glands, precisely as they are in uterus and ovaries—the development at the time of puberty, even the menstrual congestion, and, the period of sexual life being closed, the shrivelling of the breasts. A separate functional activity, however, is established during the puerperium, whilst the development of the mammary gland accompanies that of the uterus: its highest functional activity is in process when involution takes place in the pelvic viscera. Hence we see a distinct purpose served and the functions of the mammary gland independent in time and purpose of those in the pelvic viscera. All physiological changes in the pelvic organs have an exponent in well-characterized changes in the mammæ, and even physiological changes

are there depicted. The enlargement of the breast which accompanies puberty and pregnancy, the retrograde metamorphosis during the menopause, are not resultants of uterine and ovarian changes, but concomitants dependent upon the same general fluctuation of sexual life. The same mammary symptoms may appear in very different relation to the pelvic status as a resultant of the same cause, as a concomitant or indirect response. The congestion of the gland which accompanies conception or menstruation is by no means an evidence of dependence upon the uterine condition, a reflex response to pelvic stimulus; and yet such reflex occurs frequently as a swelling. Pathological changes in the pelvic organs are more likely to determine reflex symptoms in the mammary gland, the concomitant changes more commonly accompanying physiological conditions. The most frequent of the mammary reflexes are a swelling of breast or nipple, or both, and a pain more or less deep-seated—a mastodynia. These may appear as constant or pathological neuroses, with menstrual exacerbation, or merely in response to the monthly intensification of uterine disease.

Case LVII. *Menstrual Hystero-neurosis of the Breast; Peripheral Cardiac Neurosis; Laceration of the Cervix, Endometritis, Retroversion, Descensus Uteri; Operation; Cure.*—Mrs. McC——, 32 years of age, of good constitution, had been in excellent health before her marriage, but began to fail slowly after the birth of her first and only child. Nervous symptoms slowly developed; great prostration, nervous and physical, resulted from the profuse menorrhagia and the painful central symptoms. Hemorrhage was checked by curetting of the uterus, and the patient appeared to gain strength, but the reflex symptoms in nowise abated. Great nervous prostration existed and she suffered intensely from mental anxiety, a sudden feeling of something terrible about to happen; she could not lie still in one room; jumping up to seek a safe place in another, her fears drove her from place to place. At times she had "spells," as she called them, as if she must die; palpitations of the heart, with a thumping that appeared audible, caused great anxiety. She had a feeling as if her breath was being drawn from her; insomnia, with symptoms all aggravated with the coming of the menstrual congestion; and with this exacerbation came a swelling with pain in the left breast, the left side of the pelvis being the most affected. Left laceration with slight perimetritis. April 26th, treatment was inaugurated—local applications of mild astringents to the cavity, galvanism, reposition, and support of the uterus with elastic tampons repeated on alternate days. After the third treatment the severity of the symptoms abated. The menstrual period coming on after the fourth or fifth treatment was accompanied by much less suffering. She was enabled to rest with comfort at night and to lie quietly in the daytime, her fears no longer haunting her; the mastodynia was slightly diminished. The

patient improved in appearance and in spirits, and her complexion cleared, and after nine more treatments in the next intramenstrual period, the flow came on without the swelling and pain in the breast which for the past year had invariably preceded it, and which had come with such regularity and severity that the patient looked upon them as indications that the period was at hand.

In this case the reflex nature of the symptom was clearly proved; its appearance with anteflexion and development with uterine symptoms, and its cessation with improvement in the pelvic condition even before a cure was effected, characterized it as a genito-reflex neurosis.

Case LVIII. *Constant Hystero-neurosis of the Breast.*—Mrs. S——, aged 30, hysterical, nervous, married nine years; sterile; has acute anteflexion, endocervicitis, oöphoritis, and hydrosalpinx. While the fluid in the cyst is accumulating the patient is confined to her bed with neuralgic headaches and intense hypogastric pains; at such times the breasts become tense and exceedingly sensitive, with a dull, heavy, rarely a lancinating, pain, which penetrates to the shoulder-blade. This period of accumulation and suffering, direct and reflex, is followed by a copious watery discharge per vaginam, and relief from the pain. The breasts then become less tense and painful; the menses are comparatively regular, and have no causal connection with the mammary enlargement and suffering, which in this case is dependent upon and indicative of the intensity of the pelvic suffering.

Case LIX. *Menstrual Hystero-neurosis of the Breast.*—Mrs. M——, aged 33, married at nineteen, sterile; anteflexion, painful dysmenorrhœa; the appearance of the menses is preceded by shooting pain in the breasts, most severe when the general suffering is increased, and always easier when the flow comes or ceasing altogether with the disappearance of the discharge.

After operation for the flexion these severe premenstrual mammary pains disappeared, but instead a soreness of the nipple and swelling of the breasts showed themselves in the week preceding the flow, which completely passed away with the relief of the hyperplasia by treatment after cure of the stenosis.

Case LX. *Lateroflexion with Slight Anteflexion; Dysmenorrhœa.*—Mrs. S——, aged 22, married at nineteen; sterile. Two or three days before the time of the monthly change lancinating pains began to appear in the breasts, which became tender to the touch, but did not increase in size; this condition continued throughout the period, and disappeared with the cessation of the flow.

The development of the mammary gland accompanying that of the pelvic organs at puberty is often associated with an unnecessary turgescence and pain, which is most probably a reflex neurosis and not a necessary concomitant of the physiological condition. The gland may

be the seat of intense pain without swelling; the nipple alone may be swollen and sensitive, or the entire gland tense and painful to the touch. This is the more frequent of the hystero-neuroses, usually appearing two or three days before the flow, and passing away with its cessation, rarely a few days later; sometimes with the coming of the free discharge when the catamenia are well established.

IX. The Glandular Neuroses.

The dependence of glandular changes upon the varying conditions of the female sexual organs has never been brought to the attention of the profession in its full extent, notwithstanding the close relationship which is known to exist between certain glands and the reproductive organs. Popular belief in olden times pointed to the thickened neck as an evidence of consummated marriage or of pregnancy: this was the reflex congestion of the thyroid. Ovariotomists know that inflammation of the parotid is liable to accompany ovarian sepsis or inflammation of the pelvic peritoneum, and in the male the response of parotid disease to affections of the testicle is known to every practitioner, as well as a relation of somewhat different character, the metastasis, as it is called, of the mumps to the testicle.

Perspiration, hypersecretion of the sudoriparous glands, and increased salivation, which I believe to be glandular reflexes, were looked upon as a sign of pregnancy by the fathers of medicine.

The glandular changes which accompany physiological and pathological fluctuations in the reproductive organs are by far more numerous than is generally supposed. I have enumerated above the best known of these peculiar phenomena, but even the important glandular organs seem to respond occasionally to a perverted or morbid impulse from the genital fibres. The liver especially seems at times to answer the ganglionic impulse, as do the less important cutaneous and subcutaneous glands and the small glands of the stomach and intestines. I do not wish to be misunderstood and to appear as saying that the glandular changes which accompany the development of menstruation or pregnancy are of necessity reflex neuroses. Changes in the entire system which are the natural resultants of the potent stimulus which accompanies the physiological changes in the reproductive organs—hypertrophy of the heart, increase in the quantity and quality of the blood, increased pressure to force the nutrient fluid through the developing tissue and the new-formed channels—must naturally determine a hyperactivity in the parts, and thus bring about changes of various kinds; and between the precise nature of these, whether resultant, concomitant, or reflex, we are not yet in a position to differentiate fully. The functions of the cutaneous glands are supplementary to those of the lungs

and kidneys; in fact, not only is increased labor demanded from all, but in individual cases, under peculiar circumstances, infirmity of one may necessitate increased action in another; the refuse material must be cast off, whatever the path may be. Thus, even the kidneys are influenced, and we well know the peculiar dependence of renal action upon the emotions, and that the anastomosing ganglionic fibres connect with the uterus as well as with the brain and spinal cord: whilst the profuse, pale urine indicates a hypersecretion in response to cerebral stimulus, the frequent and painful micturition may be the result of morbid molecular action imparted from the uterine centre: painful or frequent micturition which accompanies the menstrual period or uterine disease is not of necessity caused by pressure of the temporarily enlarged uterus, but may, I believe, be an evidence of nerve-irritation, a reflex symptom.

Thyroid Enlargement.—This symptom, taken as an evidence of physiological activity of the reproductive organs by the poets and physicians, as well as the common people of Rome, was even regarded by so acute an observer as Meckel (Barnes) as a repetition of the uterus in the neck. This I have repeatedly observed as an accompaniment—I cannot say positively a reflex—of uterine disease; thus this enlargement existed, together with a pharyngeal neurosis, in a young girl suffering from painful menstruation, and, after resisting local treatment, yielded slowly, long after the disappearance of the accompanying reflex, with general improvement and a cessation of the menstrual pain.

As a proof of the peculiar influence of the nervous system upon this gland I may cite the coexistence of goitre, idiocy, and deformity in the cretins of the Alpine valleys.

Case LXI. *Genito-reflex Thyroid Enlargement.*—Mrs. H—— was annoyed by this very observable thickening of the neck, which appeared to decrease a little upon the application of galvanism after having resisted the iodine treatment, and lessened decidedly with improvement of the uterine disease. Whether it first appeared in response to this or as an accompaniment of pregnancy I cannot say, as its development was coincident with both.

Salivary Glands; Salivation; Induration and Impeded Action.—A hypersection in both glands may accompany menstruation or pregnancy, and when it occurs is frequently one of the first evidences of conception, so that its appearance in the second pregnancy is recognized at once by the patient as a mark of her condition, of which she has no other proof at the early day at which this reflex appears. It is the fact of this rapid development so soon after conception has taken place, long before secondary circulatory changes occur, that leads me to look upon this as a physiological reflex.

A highly-educated lady, the wife of a physician, was afflicted in her first pregnancy with this same symptom, which again appeared soon

after the second conception, and in less than twenty-four hours. The salivation had been so annoying that she well remembered it, and at once looked upon its return as an evidence of pregnancy. This was soon verified. The reflex persisted throughout the entire period: severe in the earlier months, it becomes less annoying in time, to pass away entirely with delivery.

The hardening of the salivary gland upon one side I have observed as an accompaniment of excessive hypertrophy of the uterus with cellulitic effusion, and in a young girl at puberty it existed as an accompaniment of a painful menstruation; and so certain an indication was this that a hardening more or less intense invariably served to indicate the character of the coming period.

Goodell, in his paper on "Inflammation of the Parotid Glands following Operations on the Female Genital Organs,[1] mentions two patients, one with excessive salivation during menstruation, the other suffering from a congested and diseased left ovary, with a left parotid gland which did not secrete during menstruation, causing the mouth and fauces on that side to be dry and painful, as in my own cases mentioned above. Barnes looks upon salivation as simply an evidence of the general glandular activity induced by pregnancy; which, it may be conjectured, is a provision for the elimination of excess of circulating fluid and products of nutrition that have to be cast off; whilst he truly says that, as in so many other instances, physiological provisions easily pass into morbid excess, as in the patient who came into his consulting-room holding a pint mug, which was a constant companion, being filled several times a day. I can hardly agree with this statement of the able author, because we may see likewise a diminution of the secretion, as in my own cases and the one mentioned by Goodell, which serves to strengthen my belief in the reflex nature of these symptoms.

The hystero-neuroses of the salivary glands, precisely like the reflex symptoms on the part of the nerves, the skin, and other organs, may exist either as a paralysis or a hyperactivity, so well observed in the circulatory system, which gives evidence of the reflex either by the flushes, the paralysis of the vaso-motor system, or by the cold skin, the chill, the hyperactivity. The sudoriferous glands respond in the same way, either by perspiration or by a dry skin.

The metastasis of mumps to the sexual organs in both sexes is a remarkable evidence of the existing nerve-connection. In the female the breasts, the ovary, the womb, and the labia are the organs in which the sympathetic transference takes place: in the male it is the testes. During the later stages of acute specific fevers it is not uncommon to meet with parotid bubo, a septic inflammation of the parotid glands,

[1] *Transactions of American Gynecological Society*, vol. x. p. 211.

ending very generally in suppuration. This form of parotitis, Goodell —from whom I have quoted the preceding—tells us, is not deemed sympathetic, but symptomatic of a poison in the blood which is exploded in the parotid glands; yet he continues: "I am not sure that an element of sympathy does not exist even in this form of suppurative parotitis, and that the parotid glands are not perverted, because we have septic fever which starts from lesions of the sexual organs."

Parotid bubo seems liable to follow ovariotomy whenever sepsis takes place. In 200 cases of ovariotomy performed by Schroeder and reported by Morike,[1] 5 cases of parotid bubo took place, with 2 deaths.

Goodell reports a swelling of a parotid gland on the third day after an ovariotomy, with barely a rise in the temperature, which passed off without any untoward symptoms, notwithstanding the alarm caused by the belief that the swelling was mumps and that it might do mischief by metastasis.

This inflammation of the parotid glands after ovariotomy is confirmed by observations of Dr. Matweff of St. Petersburg. Dr. Emmet, Dr. Mann, Dr. Baker, and Reamy all record similar cases.

Goodell also relates a case of puffing of first one and then the other parotid gland the second week after an operation for laceration of the cervix, which persisted for ninety-two weeks, so that the patient was unable to masticate solid food and had to be fed on fluids. I heartily indorse his belief that these are more than mere coincidences, but I would even go farther than the statement made by this able teacher, that "a kinship of sympathy exists between the parotid glands and the adult sexual apparatus," and would say that a direct nerve-connection is established through the ganglionic fibres by which reflex activity is excited.

The Liver.—The direct control of hepatic changes by morbid uterine stimulus I cannot positively assert, and yet hepatic pains undoubtedly occur as neurotic responses to morbid conditions of the uterus, and hepatic congestion I have repeatedly observed in patients suffering from uterine disease, the circumstances being such that we might eliminate external influences, and I have been sorely tempted to refer the condition directly to the genitalia. We cannot assume a dependence upon similar causes, as we may in the systemic congestion of pregnancy: certain it is, whatever the cause, that in the Mississippi Valley, abounding in malarial influences, hepatic conditions will readily occur in the weakened systems of patients suffering from uterine disease.

The first case of the kind which attracted my attention was that of a patient afflicted with other neuroses (Case XV.), who suffered from a pain in the region of the liver, and was imbued with the idea that

[1] *Zeitschrift für Geburtshülfe und Gynecologie*, vol. viii., 1880.

she had hepatic trouble: never satisfied with the explanation given, she was perfectly content after the statement of a physician, who examined her but superficially, that she had an enlargement of the liver; which was not the case when examined by myself and others soon after: it may possibly have been a menstrual congestion. The occurrence of hepatic symptoms in patients suffering from uterine and ovarian disease is surprisingly frequent, even though we consider the influences under which we live, and that a certain percentage of hypertrophies must be expected in this malarial region. Certainly at periods when fevers are common patients under treatment for uterine disease are the most ready victims, and at such times I invariably see many cases, as a large percentage of my patients show more or less marked symptoms of malaria, usually with hepatic complications.

Barnes in the articles so frequently referred to believes that the glycosuria of pregnant women illustrates the potency of nerve-influence upon hepatic functions, and may one day be the means of solving the mystery of diabetes, and, I would add, of reflex hepatic symptoms.

Claud Bernard's experiments, the production of sugar in the liver by pricking the floor of the fourth ventricle, furnished a striking proof of the influence of nerve-force over the action of the secreting organs. Possibly, as Barnes states, the "altered quality of the blood passing through the liver is an essential condition." Whether the action is in response to uterine stimulation through direct ganglionic connection or by means of the medulla oblongata is a question: certainly, organic lesion of the nerve-structure, as Barnes correctly observes, is not necessary as a factor, as is proved by the complete disappearance of sugar after glaucorrhœa during pregnancy and by the integrity of the nerves after its termination.

Every observation in regard to the hepatic reflexes is of value at this period; hence I will add a case of emotional icterus recently reported by Dr. McGrew,[1] to substantiate the occurrence of hepatic neuroses, be they direct nerve-reflexes or brought about through the vaso-motor system, though proved, I believe, by physiological experiment and by the genito-reflex symptom in woman: A patient who had for two years suffered from a slight urethral discharge was attacked by a severe balano-posthitis in consequence of a powerful cauterization: he became greatly alarmed, fearing the sloughing off of the penis, and the emotion was followed by an intense jaundice and an eruption of lichen upon the dorsal and lateral portions of the thorax, part of the abdomen, face, and scrotum; little or no itching. Notwithstanding treatment, the jaundice and lichen at first grew worse, but began to subside in ten days, with great improvement in the ulceration. At the end of three weeks the balano-posthitis and preputial ulceration becomes entirely

[1] *The American Lancet*, 1886, p. 364.

well; jaundice, hardly distinguishable, on the sclerotics; urine normal; lichen on face disappeared, but remained on the body for a week longer. The icterus and lichen can only be attributed, as the author states, to sudden moral emotions caused by fear, since the liver and other organs were normal; no excess had been committed, and no chill had occurred.

Among the glands affected by pregnancy Barnes mentions enlargement of the spleen.

Peculiar are the cases of women who for several years had been wholly cured of ague, and who suffered a relapse when pregnancy overtook them, and that not once only, but in successive pregnancies: when they were not pregnant not a single attack occurred. Barnes records similar cases, and asks, "Is this recurrence due to a suddenly induced enlargement of the spleen by the blood-degradation attending pregnancy, to the exaltation of neurotic irritability, or to a combination of all three conditions, or to some other which has escaped attention?" An exalted centric nerve-irritability certainly exists, but the blood-degradation I should hardly consider as the concomitant of healthy pregnancy; heightened activity of course determines a greater amount of refuse to be carried away.

The Kidneys.—Unfortunately, I have not observed with sufficient care those cases of renal and cystic irritability, of frequent and painful micturition, or variations in the secretion of urine, to determine their true nature, whether secondary, sympathetic, symptomatic, or reflex. I have been satisfied to see such cases improve, and disappear with improvement in the uterine disease. But as to the true causative relation I can make no assertion. I have not ventured to suspect their reflex nature, and, occupied of late with questions of greater interest to me, I have allowed such cases as might perhaps have led to a solution to pass from observation, satisfied with the result without sufficiently careful inquiry into the possible cause.

Hypersecretion, hyperactivity of bowel and kidney, are known to result from increased nerve-stimulations: even in animals these functions respond to the emotions. Diarrhœa I have repeatedly seen as an unquestioned reflex symptom—a menstrual hystero-neurosis yielding to treatment of the uterine disease unaffected by local medication even when violent in character, the patient, for instance, being obliged to get up six or eight times during the night: a menstrual diarrhœa which had continued for several years unabated, unaffected by remedies which had been tried, yielded to an improvement in the uterine condition after six weeks' treatment. Frequent micturition as the result of mental excitement, especially if emotional in character, is a most common occurrence; the copious clear urine is an almost invariable response to nervous excitement, occurring so frequently that it may be taken as an evidence of such state. More doubtful is the albuminuria of pregnancy

without structural changes, which I believe at times to be the result of nerve-stimulus arising in the uterine terminals—a reflex neurosis. This is one of the various forms of albuminuria gravidarum, and I believe equally dangerous to the patient as a cause of puerperal convulsions; and I doubt that albuminuria determined by any other cause could result in symptoms so sudden and so violent: the loading of the urine with albumen, dangerous convulsions, all of which suddenly cease with removal of the cause, with the expulsion of the fœtus, the emptying of the uterus. Unfortunately, I cannot adduce evidence as satisfactory as I should like to bring forward as proof of the reflex nature of cystic and renal phenomena. The theory has been sufficiently discussed, and upon this I will not enter, as facts sufficiently positive I cannot add.

The hysterical bladder by which vesical catarrh, and even stone, are simulated is one of the symptoms of that still mystic disease, hysteria, probably a response to spinal or cerebral irritation; but as we know that the innumerable fibrils which carry the uterine stimulus not only to all the great centres, but also to the most distant terminals, extend to the bladder as well, as they do to other organs, we may expect to find these neuroses in response to irritation from uterine ganglia as readily as from the spinal centres.

Résumé.

I trust that I may have succeeded in directing attention to the frequency and importance of the hystero-neuroses, those reflex symptoms on the part of the different organs which so closely resemble disease in the cutis and in the glands, even approximating it in all particulars, with accompanying structural changes. The reflex nature of these phantoms of disease has been appreciated by the popular mind in olden times, as it is to some extent at the present day: certain of these phenomena are so common that they have been accepted as signs of pregnancy, and, notwithstanding the intuitive understanding of their nature by the ignorant, the medical profession apparently persists in ignoring their true nature. There is no more striking evidence of this unfortunate fact than the unswerving course of the practitioner in the treatment of the nausea and vomiting of pregnancy. This well-known reflex symptom, which yields promptly in most instances to uterine treatment, like other reflexes is indifferent to direct medication. Of late years these most interesting, most peculiar, and by their frequency and violence important symptoms have been studied by various specialists, and yet the intricate coil has not been fully unravelled, because the study at all times has been from one side only. The gynecologist alone cannot solve the secret of the reflex dermatoses: whilst by his treatment of the uterine disease he cures the cutaneous eruption, his

ignorance of all special study of dermatology does not enable him to fully utilize the advantages offered him for observation. The dermatologist, on the other hand, recognizing a kinship between certain eruptions and the functional changes and diseases of the reproductive organs of women, is not able to assure himself positively of its nature: he recognizes only a cutaneous disease which is peculiarly unyielding to treatment. Whilst the existence of reflex symptoms on the part of various organs and the known dependence especially of mental and nervous phenomena upon uterine changes, so evident more particularly during puberty, menstruation, and the menopause, have excited the interest of individual observers, the reflex has rarely been clearly distinguished from the secondary or concomitant phenomenon, and the practical bearing of the question has not been revealed; hence it has been avoided by teacher and textbook, and this eminently practical and important field still remains a waste. The specialist alone seems to have observed these phenomena, and has looked upon them more as oddities, and not as fit subjects for scientific investigation and medical teaching: textbooks and teachers tell the student practically nothing of this grand group of symptoms, and yet it is an element in his education as important almost as auscultation and percussion. Let me recall only a few of the cases I have mentioned in this paper: A gastro-neurosis, treated as a disease of the stomach for years, leads to a gradual decline, the stomach irritated by constant medication, the system deprived of proper nutrition, and the unrecognized uterine disease insidiously progressing until it has become unmanageable when finally discovered: the health of this lady has been destroyed, after years of most unnecessary suffering, because the reflex nature of the gastric symptoms was unknown to any of the physicians who had been in attendance; a bronchial reflex culminating in the most violent asthmatic symptoms, so that the patient spends night after night in the greatest agony, never able to lie down, is treated as a true bronchial affection for years, until the constitution is broken and the pelvic disease has progressed so that treatment alone was no longer sufficient; although the reflex even then, after persisting for years, yielded to the reposition of the retroflexed uterus within a few minutes, all her organs, above all her nervous system, had suffered so that she did not survive the necessary operation: if taken in time, proper uterine treatment, mild in character, would have stayed at once the development of all of the morbid processes; but this patient likewise fell a victim to the treatment of the most apparent symptom, the reflex, instead of the causative uterine disease, which was completely ignored; or I may instance the case of the lady treated for her gastric and muscular rheumatism, which of course did not yield, who was then sent abroad, and there directed to mineral springs for what was termed a nervous debility, and urged

to exercise, sent upon long walks, which of course aggravated the uterine disease, which had so far been completely ignored; as a consequence, all treatment has been in vain; and how easily would proper local treatment have restored her to health!

Such of these reflex phenomena as are dependent upon disease and changes in the female reproductive organs I have endeavored to picture in my study of the hystero-neuroses ten years ago. Since then the subject has been elaborated, and especially the reflex phenomena which appear with the semblance of disease in the lungs, bronchi, and eye, and the reflex dermatoses have been elaborated; and all who have studied the reflexes, in whatever organ they may occur, coincide fully with me in the stress laid upon treatment of the causative disease, and the utter inefficiency of all attempts to allay the symptoms by direct medication, by such treatment as is indicated by the disease proper of which the phantom only is before us. I have here sought to describe the hystero-neuroses, the reflex symptoms depending upon changes in the sexual organs of women, and I have accepted as such none of the various symptoms of hysteria, but only such as have been proved to be directly dependent upon the genital lesion.

An examination of the cases cited will prove the fact, which may appear somewhat strange—namely, that the great mass of these symptoms seem dependent upon uterine changes, and not upon those of the ovary. Whilst in the cases I have cited the treatment has always been directed toward relief of all existing pelvic disease, the uterus has been in the main the organ affected; and in the majority of cases it was an improvement in the condition of this organ which was followed by a disappearance of the reflex symptoms. In many cases, and in the most violent, such as the terrible asthma or the tetanic convulsions, the uterine treatment was followed by a prompt response, the insertion of a stem pessary, by correcting the retroflexion, suddenly checking the terrible asthma which had persisted for years; upon the cauterization of an eroded cervix the most violent epileptiform attacks vanished as if by magic. Treatment of the ovary alone I have never attempted, and a direct reference of the reflex symptom to ovarian lesions I have not been able to detect. A careful examination of the numerous cases here recorded leads me to believe that the cure of violent neurotic symptoms by oöphorectomy, by Battey's operation, is obtained indirectly by the uterine involution following, and not directly by the removal of the ovary as the offending organ. This will be readily accepted if we recall how suddenly a reflex symptom vanishes if the causative condition be reached—the displaced uterus supported, a narrowed canal dilated; after operation for laceration of the cervix, the most painful neuroses, even the discoloration of the skin, frequently pass off, if not with the placing of the suture when union has taken place, long before

constitutional improvement has taken place. Rarely has such striking relief been afforded by the removal of the ovaries by oöphorectomy, though undertaken especially for the cure of nervous diseases which seem referable to pelvic disorders and have resisted treatment. This, together with the known dependence of these reflexes upon uterine changes, leads unquestionably to the belief that a cure of nervous symptoms by this operation is impossible unless it is attained by uterine involution following the operation, and not by the operation itself.

The reflex neuroses, as we have observed, may persist after the molecular nerve-changes have continued for an undue length of time, and it is especially the eye, that most delicate organ, which is liable to a persistency of the reflex after the cure of the causative disease and to the development of the disease proper from the phantom. Likewise, we have seen that the reflexes may be relieved by the sedative action of galvanism upon the irritated uterine terminals. The action of this agent upon the exhausted nerve in the organ in which the symptom appears leads only to temporary improvement, whilst this is more certain and may prove permanent when directed to the uterine fibres or ganglia from which the morbid impulse emanates.

The variety and the importance of the reflex neuroses, whether dependent upon lesions in the sexual organs of women, upon changes in the mucous membrane of the nose, of the throat, or other parts, should secure for them a permanent chapter in the theory and practice of medicine, and the student must be taught the diagnosis and treatment of phantom disease as he is of the disease itself.

EXTRA-UTERINE GESTATION.

By T. GAILLARD THOMAS,

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History.—In no field of medicine is the dependence of pathology upon a correct knowledge of physiology more clearly shown than in that of Ectopic Gestation. To the ancients, in their ignorance of embryology and of utero-gestation, this interesting and important occurrence must have been, and was, an enigma beyond the power of solution; and we see even so capable and so recent an accoucheur as Mauriceau refusing to admit the possibility of it.

As the process by which the ovule becomes impregnated within or near the ovary, passes downward through the Fallopian tube, and invests itself in its rapid evolution with the amnion and chorion became known to the students of more recent times, the possibility of the fixation of the impregnated ovule upon the lining membrane of the Fallopian tubes, upon the peritoneum or its contained viscera, or within the ovary itself, was gradually appreciated. This knowledge was not arrived at rapidly, but was the outcome of steady and progressive physiological research until the full understanding of to-day was reached.

Paré, Smellie, Roederer, Astruc, and other obstetricians of the olden time left on record instances of it, which they recorded, but were unable satisfactorily to explain, and Baudelocque, Capuron, Gardien, Velpeau, Denman, and others advanced beyond their level and wrote with intelligence upon it. Then came the time when, through the researches of Coste, Negrier, and Raciborsky, the true physiology of ovulation and menstruation was made clear and the process of embryology rendered comprehensible. From that time light has been freely cast upon a subject previously so mysterious and incomprehensible. It is never wise to believe that we have reached the end of knowledge upon any subject, and yet so satisfactory and so full are our data upon the physiological and pathological sides of ectopic gestation that we are almost inclined to believe that the whole truth is in our possession. This remark applies only to the physiology and pathology of the subject: as to diagnosis and treatment, we have just entered upon avenues

which, there is hope for believing, will lead us to results which will produce the greatest advantage to science and to humanity.

Should any one imagine, however, that the men of the generation just past were very far behind us in knowledge upon this subject, let him read the extremely able and interesting article of Velpeau in the *Dictionnaire de Médecine*, published in 1836, and he will be impressed with his error.

Definition and Synonyms.—The simplest and most comprehensive definition of extra-uterine pregnancy or ectopic gestation is this: the fixation and development of an impregnated ovule outside of the lining membrane of the uterus. The growing fœtus may even be within the uterine cavity, as in interstitial pregnancy, and yet the gestation be ectopic; or the fœtal body, entering the uterus through one of the tubes, may develop there, the placenta being attached to the tube, and yet a true case of extra-uterine pregnancy exist. An essential of normal pregnancy is the fixation of the fœtal ball and the subsequent development of the placenta upon the endometrium itself. The essential for extra-uterine pregnancy concerns the location of the placenta, rather than that of the child's body; and this primary fact is closely allied to one which concerns the condition much later—namely, that in treatment the management of the placenta is in these cases of greater importance than that of the body of the child itself.

Varieties.—For the practitioner at the bedside there are three grand varieties of ectopic gestation—the tubal, the abdominal, and the interstitial. For him, depending as he does upon the use of his senses in developing clinical facts, a minute diagnosis involving the ascertaining of anything more exact than this is virtually impossible. For the physiologist and pathologist there are many more which are not only interesting in themselves in connection with embryology, but which are quite ascertainable in post-mortem investigation. The following chart presents at a glance all the varieties of the condition with which it is essential that the student should be familiar:

Tubal.	*Tubal:* The fœtal ball between fimbriæ and uterine surface. *Tubo-ovarian:* Fœtal ball between fimbriæ and ovary. *Tubo-uterine:* Fœtal ball in tube between mucous and serous surfaces of uterus. *Tubo-abdominal:* Fœtal ball engaged in fimbriæ and falling with tube into abdomen, and there receiving nourishment; or, the tube having ruptured, the fœtus escaping into abdomen and placenta remaining in tube.

Abdominal.	*Primary:* Ovum falling into abdomen, and there attaching itself. *Secondary:* Fœtus with placenta entering abdomen by rupture of the tube or ovary, and developing there.
Interstitial.	The impregnated ovum from laceration entering into uterine parenchyma and developing there.
Ovarian.	The ovule, being fructified within a Graafian follicle, there developing, and the ovary growing, as with ovarian tumor.

Wonderful and eccentric are the migratory performances of which the extra-uterine impregnated ovum is capable—so wonderful, indeed, as to be almost incredible, and giving rise to exhaustive classifications.

Hubert de Louvain made twelve subdivisions, and Dezeimeris ten, of the condition. In my own experience I have found an abdominal fœtus taking its nourishment through a four-pound placenta from the entire extent of the colon from caput to sigmoid flexure; in another case, in which I removed the fœtus by elytrotomy, it was developed between the layers of the broad ligament, and was outside of and beneath the peritoneum, as described by Dezeimeris and others; and in a case which I saw with Dr. Janvrin, and another with Dr. McBurney, the fœtus lay in the tube where it passed through the uterine wall (tubo-uterine), and was forced into the uterine cavity and delivered *per vias naturales.*

Instances[1] are recorded in which the fœtus has been found in utero and the placenta in the tube; and *vice versâ*, in which the growing fœtus was outside the mother's body in a hernial mass, and in which twin pregnancy existed, one fœtus intra- and the other extra-uterine.

The following is the classification of Dezeimeris, published just fifty years ago:

1st, Ovarian pregnancy;
2d, Subperitoneo-pelvic pregnancy;
3d, Tubo-ovarian pregnancy;
4th, Tubo-abdominal pregnancy;
5th, Tubal pregnancy;
6th, Interstitial tubo-uterine pregnancy;
7th, Utero-interstitial pregnancy;
8th, Utero-tubal pregnancy;
9th, Utero-tubo-abdominal pregnancy;
10th, Abdominal pregnancy.

[1] Velpeau's article in *Dict. de Méd.*, 1836.

It is an encouraging sign that fifty years of labor and of observation have diminished rather than increased the number of these subdivisions.

Mr. Lawson Tait maintains—and, it appears to me, upon very rational grounds—that it is highly probable that every extra-uterine conception takes its origin in the Fallopian tube, and that all the subdivisions and varieties noticed by authors are due to change of position of this part, adhesion of it to other organs of the body, or escape of its contents by laceration into the abdominal cavity. Upon this theory can readily be explained all the varieties mentioned by Dezeimeris, excepting only ovarian pregnancy, at best a variety of doubtful authenticity.

In concluding this part of my essay, however, I would, from my own experience with the great, sometimes insurmountable, difficulties of diagnosis attending these cases, advise the general practitioner to cling to the safe and simple classification of tubal, abdominal, and interstitial, as little likely to confuse him and as being sufficiently comprehensive for all the requirements of practice.

Frequency, and Relative Frequency of the Varieties, of Extra-uterine Pregnancy.—So many cases of this condition pass undiscovered, death from rupture of the sac being attributed to hæmatocele, peritonitis, or to some variety of abdominal tumor, that statistics upon this point are very unreliable. The only way in which we may approximate the truth is by relying upon the reports of well-regulated hospitals in which autopsies are uniformly made, and even here the question is not satisfactorily answered.

Bandl[1] declares that out of 60,000 gynecological and obstetrical cases received during seven years at the clinics of Carl Braun and Späth in Vienna, there were only 5 cases of extra-uterine pregnancy. Hecker, one of the most reliable authorities upon this subject, declares that of 222 cases which he analyzed, 64 were tubal, 26 interstitial, and 132 abdominal.

Parry collates 500 cases with the following results: 214 were tubal, 27 were ovarian, 29 were abdominal, and 230 were doubtful.

In my own cases I have taken the greatest care to arrive at correct conclusions upon this point, and believe that I am right in presenting my statistics thus: Out of my 33 cases, 19 were tubal, 12 were abdominal, 2 were interstitial (1 certainly and 1 probably), and none gave any reason for the supposition of the existence of the ovarian variety.

Any one who has witnessed post-mortem examinations made in these cases will appreciate the great difficulties attending the decision as to the variety of ectopic gestation which exists. The parts are matted together, put into unnatural relations, and altered by months of serious tissue-changes. During the past twenty years I have personally examined and treated 33 cases. Basing the estimate upon Bandl's statistics,

[1] Hart and Barbour: *Gynecology.*

these 33 cases would represent 372,000 cases seen in practice during a period of twenty years, or 18,600 cases every year. This estimate is vitiated, however, by the fact that the great majority of my cases were seen in consultation with other physicians.

No better evidence of the barrenness of our knowledge as to the frequency of ectopic gestation can be advanced than the paucity of statement concerning it on the part of authors: by many it is scarcely mentioned, and by all it is dealt with very superficially indeed.

As to the relative frequency of the different forms, information is more attainable, though even here it is of doubtful authenticity, owing to the obscurities of examinations, both ante- and post-mortem.

ETIOLOGY.—The causes of ectopic gestation may be divided into remote and immediate. I will present them first at a glance, and then before closing the subject speak of some of them specially:

Predisposing Causes.

a. Prolonged nulliparity;
b. Old attacks of pelvic peritonitis;
c. Old attacks of salpingitis, especially if they have been specific;
d. The existence of any uterine or tubal neoplasm;
e. Old hæmatocele.

Immediate Causes.

a. Strictures of tube, congenital or acquired;
b. Obstruction from mucus or pus;
c. Obstruction from swelling of mucous membrane;
d. Pelvic tumor pressing upon uterus or tubes;
e. False membranes distorting or compressing tubes;
f. Polypi in tubes;
g. Cancer, sarcoma, or fibroma in tubes or in uterus at the horns;
h. Previous amputation of uterine body, the ovaries being left;
i. Rupture of uterus or tubes from traumatism;
j. Severance of fimbrial union of ovary and tube.

Other causes have been mentioned by authors, but they are of doubtful authenticity, and I omit them; such, for example, as abuse of coitus, sudden emotional influences developed during the act, etc.

An example of abdominal pregnancy due to removal of the body of

the uterus without simultaneous removal of the ovaries is recorded by Koeberle. Conception occurred two years after the operation, a fistulous tract having of course kept up communication between the vagina and abdomen.

While agreeing in the necessity of recognizing these predisposing and immediate causes of ectopic gestation as sufficient and important factors, I cannot look back upon my list of cases without being struck by the fact that the large proportion have occurred in strong, previously healthy workingwomen who have given no reason for the fear that such a peculiar pathological condition would develop. One of my four cases delivered after full term by laparotomy was a farmer's wife; another, a fishmonger's wife living in this city, apparently a sturdy woman; and a third, a strong and healthy negress. Of course some of my patients were women of different condition, but the majority were by no means persons in whom one would have suspected the causes predisposing to ectopic gestation as here tabulated.

The only valid deduction to be drawn is this: So wonderfully and beautifully poised is the mechanism of conception and gestation that a very trivial cause will disorder it, as a grain of sand will mar the working of a telescope. No result occurs, either here or elsewhere, without a sufficient cause. I merely desire to point out the fact that previous to the occurrence of this condition no valid reasons for suspecting such pathological states as I have mentioned ordinarily existed in most of my cases.

Pathological Anatomy.—Nothing is more delusive than the deductions based upon post-mortem examinations when practised by one unequal to the task which he undertakes. Nowhere is this more true than in ectopic gestation, where great hypergenesis of tissue, altered relation of parts, effusions the result of various inflammations, and the accumulation of the products of oft-recurring hemorrhages combine to render difficult the solution of the case for an expert, and impossible for a tyro. If the latter would acknowledge his dilemma and refuse to draw deductions, no harm would result beyond the loss of good material; but, alas! he tries too often to meet the difficulty by freely drawing upon his imagination, and the result for science is not good.

Every student is familiar with the changes which occur in the uterus when the impregnated ovum attaches itself to the endometrium. These may be summed up in a general way thus: first, rapid and immediate increase in vascular apparatus and blood-supply; second, intensification and concentration of nervous influence; and third, rapid subordination of the functions of all the organs of the body to the newly-developed state. All these changes occur in ectopic as in normal pregnancy, the only difference being that the "signs of pregnancy" are less regular

and reliable, and that the creation of the placenta being called for upon tissues not intended by nature for the vicarious work now imposed upon them, the excessive and exaggerated growth of vessels which results surpasses everything of the kind ever witnessed in the economy. He who merely reads this statement as a student may regard it as a phrase merely. He who as an operator pricks the ectopic fœtal ball, even with the finest hypodermic needle, may have cause to appreciate that it conveys an important truth.

Let the student remember that with all the varieties of extra-uterine gestation which have been mentioned, there are but three tissues to which the fœtal ball is ever claimed to attach itself: first, the mucous membrane of the tube, which is the source of nourishment in the tubal, interstitial, tubo-ovarian, tubo-uterine, and tubo-abdominal varieties; second, the lining membrane of the Graafian follicle, which serves for the ovarian form; and third, the peritoneum, to which is attached the fœtal vessels in all the abdominal forms. Further, it is evident that in all the composite varieties there is a combination of nourishment from two forms of tissue—the mucous membrane of the tubes at their fimbriated extremity, and the serous membrane of the abdominal cavity.

Not only does development occur in these cases in and around the vicarious womb; the uterus itself enlarges, becomes softened in its tissues, and is covered by a deciduous membrane; the vagina becomes vascular, soft, violet-colored, and distensible; and the mammæ become enlarged and the presence of milk shows itself in them.

Except in interstitial pregnancy there are, however, three features of uterine development in ectopic gestation which must be borne in mind as of diagnostic value: first, the cervix to the touch is less soft, less distensible, and less large; second, this part is usually found toward the front of the pelvis and high up, instead of lying in the hollow of the sacrum and low down; and third, as pregnancy advances the uterus does not enlarge proportionately.

The placenta is not symmetrical in shape, and sometimes grows to gigantic proportions. In one of my cases treated by laparotomy I removed a portion of it only, and found it to weigh four pounds; at least one pound more must have been left in the abdomen.

To illustrate the extraordinary appearance which the placenta may present under these circumstances, I mention this incident: As I was proceeding to remove it on that occasion a colleague who stood by said, "Is not that the liver at which you are pulling?" I was for a moment completely taken by surprise, and felt that awful sensation, which every operator will readily appreciate, that one feels when he finds himself upon the verge of a blunder. Passing the hand upward, I at once assured myself of the falsity of the suggestion and proceeded with the operation.

Such a case as this makes very comprehensible the singular fact illustrated by Pollak's interesting case of twin pregnancy—one child developing within and the other outside the uterus, and the latter being much the better nourished and the more vigorous of the two.

In tubal pregnancy the placenta is attached to the wall of the tube—in ovarian pregnancy, originally to the ovary; in abdominal pregnancy, to the parietal peritoneum, the intestines, the mesentery, or any of the viscera. In one case I found it growing from the bladder, and would surely have lost my patient from hemorrhage had I operated during the life of the child and the activity of the placenta. As it was, I encountered great difficulties, and left the placenta to come away by exfoliation.

As in normal pregnancy, so in ectopic: the death of the fœtus is usually at once followed by diminished placental vascularity, gradual atrophy, and final shrinkage. But as there are exceptions to the rule in the former, so are there in the latter. A striking instance of this is given by Hart and Barbour,[1] the title of which gives its history: "Case of Extra-uterine Gestation, with Death of the Fœtus, but continued Growth of the Placenta, which led to Fatal Hemorrhage."

Sometimes the ectopic fœtal shell will be found surrounded by layers of coagulated blood the result of repeated hemorrhages. In a case seen by me with Dr. Ferdinand Beach several distinct blood-layers could be recognized, and the difference of age between them be readily estimated by color and degree of consistence.

Course and Terminations.—A very common history of ectopic gestation is, unfortunately, this: A woman becomes pregnant, gives all the ordinary symptoms of that condition, presents none which call for special examination, is suddenly seized with agonizing pain in the abdomen, rapidly becomes collapsed, and soon dies. A post-mortem examination reveals a ruptured Fallopian tube and a small fœtus, probably between the tenth and fourteenth week of development, in the peritoneal cavity, surrounded by a mass of coagulated blood. No lesson can be learned from the case, no maxim put on record, by which repetition of such an accident may be prevented, and no rule established which can give us much comfort for the future.

Fortunately, these "cataclysmic" cases, as Barnes appropriately calls them, are by no means the rule. Nevertheless, they have always occurred, and probably will always do so to the end of time. Like the "apoplexie foudroyante" of the French, their invasion is so sudden and so overwhelming that the resources of our art are powerless to withstand them.

In other cases the rupture occurs; a large hæmatocele results; the patient rallies; by slow degrees the mass of blood is absorbed and the

[1] *Manual of Gynecology*, p. 555.

fœtal bones become encapsulated, or an irritation of surrounding parts is excited by them, and they are extruded by the abdominal wall, the rectum, the vagina, or the bladder.

In some cases the pregnancy advances to full term; at the end of the ninth month labor-pains come on; the unsuspicious obstetrician examines by touch, and, to his amazement, finds that the labor is a false one, the cervix small and contracted, and the uterus empty. It is extraordinary how promptly the child dies under the influence of these spurious pains.

In the most remarkable case of my list of thirty-three, Dr. Jewett saw the patient one night, during which "hard labor" lasted, the child being alive, and, sending for Dr. Griswold the next day, a thorough exploration proved that the child was not in the uterine cavity and that it was dead.

After the death of the child one of a variety of terminations may occur. The placenta shrivelling and becoming non-vascular, and the liquor amnii being absorbed, the fœtal body becomes mummified, calcified (a lithopædion resulting), or a change of saponaceous character alters it into adipocere. Changed in this manner, the ectopic fœtus may remain for ten, twenty, thirty or forty years within the vicarious uterus, causing no other inconvenience than that resulting from its mechanical results.

Very generally, however, the liquor amnii assumes a puriform appearance, and hectic fever with its exhausting concomitants develops, or the angular surfaces of the fœtal body excite abscess or create absorption of tissue, which results in exhaustion and death or in extrusion and the mother's recovery.

The powers of the absorbents in removing the extra-uterine fœtus and its envelopes are truly wonderful. Some years ago Leopold of Leipsic published in the *Archiv für Gynäkologie* some interesting experiments which bear upon this subject. Performing laparotomy upon a non-pregnant rabbit, he placed within the peritoneal cavity embryonic rabbits at different periods of development, two and a half, five, six, and eight centimeters in length. In one case peritonitis ensued, the rabbit died, and the fœtus underwent such rapid disintegration that in the case of the smallest embryo introduced no trace was found on the second day. In the other cases, where peritonitis did not supervene, the animals were killed in a period varying from one to ten weeks, and it was found that the fœtal rabbits had, as a rule, been encapsulated, a great deal of the fleshy portions of the fœtus being absorbed and the skeleton remaining. From this experiment Dr. Leopold was led to believe that the recovery of patients who have suffered from rupture of the Fallopian tube and escape of the fœtal mass into the peritoneal cavity is much more common than is generally

supposed—a position which I would fully indorse from my own experience.

A woman of forty-five had been married fifteen years, but thought that she had never been pregnant. Early in married life she was supposed to be so, but she had never miscarried and had never borne a child. She came to me with a cyst the size of the head of a child a year old, and a hard round tumor which I supposed to be a calcareously degenerated fibroid behind the uterus. In three months from the time when I first saw her she fell suddenly into an almost collapsed state, and suffered greatly from pain in the tumor, which nearly doubled its size in a day or two. Her condition became so desperate after this that I operated to give her the only chance for life which presented itself. A large blood-cyst was emptied, and from the distended pouch of Douglas I shelled out the skull of a child of probably six months of fœtal life. She had suffered fifteen years before from abdominal pregnancy, the child had died, and all but the skull had disappeared by absorption.

Duration.—Extra-uterine pregnancy of any variety may reach full term, no injury resulting to mother or child. But this occurrence, which is common when the fœtus has the whole peritoneal cavity in which to grow and from which to take its nourishment, is rare in the tubal, ovarian, and interstitial varieties. I shall rest for authority in this matter upon Hecker, whose excellent statistical labors are known to all, and Cauwenberghe, for whose reports and opinions I am indebted to the excellent translation of M. Charpentier's[1] article upon "Extra-uterine Pregnancy," made by Dr. E. H. Grandin of this city.

Ectopic pregnancies as to duration observe this order: of shortest duration are the interstitial; next, the tubal; next, the ovarian; and the longest, the abdominal.

Of 26 cases of interstitial pregnancy,

The duration in	1 case	was		1 month.
"	"	"	2 cases	"	about 3 months.
"	"	"	12	"	"	3 "
"	"	"	3	"	"	4 "
"	"	"	1 case	"	5 "
"	"	"	7 cases	"	not noted.

Of 88 cases of tubal pregnancy,

The duration in	3 cases	was	4 to 5 weeks.
"	"	"	17	"	"	4 to 6 "
"	"	"	9	"	"	6 to 7 "
"	"	"	13	"	"	6 to 8 "
"	"	"	4	"	"	2 months.
"	"	"	17	"	"	3 "

[1] *Cyclopædia Obstet. and Gynecol.*, vol. ii.

The duration in 11 cases was 4 months.
" " " 4 " " 5 "
" " " 2 " " 6 "
" " " 2 " " 7 "
" " " 6 " " 9 "

In 185 cases of abdominal pregnancy,

The duration in 1 case was 15 days.
" " " 1 " " 3 weeks.
" " " 18 cases " 1 to 2 months.
" " " 4 " " $1\frac{1}{2}$ to $2\frac{1}{2}$ "
" " " 5 " " 3 "
" " " 22 " " 3 to 5 "
" " " 15 " " 6 to 8 "
" " " 18 " " 9 "
" " " 6 " " 10 to 12 "
" " " 24 " " 1 to 2 years.
" " " 10 " " 2 to 3 "
" " " 23 " " 4 to 10 "
" " " 1 case " 11 years.
" " " 4 cases " 15 "
" " " 2 " " 16 "
" " " 2 " " 20 "
" " " 1 case " 22 "
" " " 1 " " 25 "
" " " 3 cases " 26 "
" " " 3 " " 28 "
" " " 6 " " 30 "
" " " 3 " " 33 "
" " " 1 case " 35 "
" " " 1 " " 39 "
" " " 2 cases " 40 "
" " " 4 " " 46 "
" " " 2 " " 47 "
" " " 2 " " 50 "
" " " 1 case " 54 "

Mortality.—Kiwisch states it at 82.5 per cent.; Hennig, in 150 cases of tubal variety, reports 88 per cent. as fatal; and Parry, out of 499 cases, fixes the mortality at 67.20. Out of Parry's 499 cases, 336 died—147 from rupture of cyst, 54 from exhaustion, 24 from peritonitis, 4 from hemorrhage, 8 from intestinal obstruction, 4 from septicæmia, etc.

Out of my 33 cases, as will be more fully stated hereafter, 22 recovered and 11 died—a percentage of recovery equal to two-thirds.

Speaking of the condition in a general way, and not classifying the different varieties, Hart and Barbour[1] declare that "more than four-fifths of the cases end fatally."

Well may De Sinéty remark: "On voit d'après toutes les statistiques

[1] *Manual of Gynecology*, p. 554.

que quelle que soit sa forme, la grossesse extra-utérine est une affection extremement grave."

Were I asked to what I attribute the good results obtained in my cases, I should feel forced, in simple candor, to run the risk of the charge of egotism and to reply: "I attribute it to three influences: first, early and positive diagnosis; second, the prompt resort to destruction of the life of the fœtus during the early months (of 12 thus treated all recovered); and third, to an equally prompt resort to surgery in the later." It is true that out of 12 cases submitted to operation, 6 recovered and 6 died, but I feel sure that without a resort to surgery all would have been lost.

Symptoms.—As has been already stated, ectopic gestation sometimes presents no symptoms whatever, the first evidence of the existence of the condition being yielded by the occurrence of rupture.

Fortunately, this is the exception and not the rule. The manner in which the condition is most frequently discovered is this: A woman becomes pregnant, and announces the fact to her friends. As the sixth or eighth week is reached some irregularity in the signs of pregnancy, such as sanguineous discharge, with pain in one iliac fossa and down the thigh, renders her anxious, and she reports the fact to her physician. Upon examination he discovers a hard and slightly tender mass on one side of the uterus, and, his suspicions being aroused, he submits the case to full investigation, which results in diagnosis. Or a woman has reached the full term of gestation, having experienced some discomfort, but not sufficient to cause her to report it to her medical attendant. Labor announces itself by uterine contractions, and the doctor is sent for. He examines, and to his surprise discovers not only that labor has not set in, but that the uterus does not contain the child; upon this a full investigation is made, and the result is a diagnosis.

Still, a third method of discovery is met with: A woman of a low grade of intelligence calls for medical aid on account of an abdominal tumor, gives a history of false labor and supposed spurious pregnancy, and, being carefully examined, is discovered to have a fœtus extra utero.

These are the methods merely by which suspicion is so far excited in the mind of patient or of physician as to prompt an investigation. Those by which a diagnosis is reached are of a very different order. The most reliable rational signs are these, engrafting themselves upon the ordinary signs of normal pregnancy:

1st. Sanguineous flow of greater or less persistency;

2d. Occasional gushes of blood occurring without assignable cause and disappearing without treatment;

3d. Iliac pain sometimes extending down the thighs;

4th. Paroxysmal pelvic pain;

5th. Symptoms of abortion attended with expulsion of pieces of decidua without expulsion of a fœtus;

6th. Recurrent pelvic inflammations suddenly developing;

7th. As the fourth month is reached symptoms of pressure, as if from a retroverted gravid uterus, frequent micturition, etc.

If in a pregnant woman who presents in her symptoms the peculiarities just mentioned there be discovered in the pelvis a mass of ovoid shape, on one side of or behind the uterus, which is slightly movable, tender upon pressure, and which obscurely gives the impression that it contains fluid, the probabilities are very great that ectopic gestation exists. If under the influence of ether thorough examination of the mass shows that it is not a phlegmon in one broad ligament, or an hæmatocele (of rare occurrence during pregnancy), and by careful ballottement the drop of a small solid body can be felt (as it very rarely is), this probability becomes greatly increased. If the passage of an interrupted galvanic current of twenty cells produces within forty-eight hours a flaccidity in this mass, a general improvement in symptoms, and a sudden arrest of the progressive signs of pregnancy, this probability becomes as much a certainty as diagnosis often is in cases of disease attended by some obscurity.

It may be doubted whether at a very early period ballottement is ever obtainable. I assert positively that in three cases of tubal pregnancy I have appreciated it, and demonstrated it to others as early as in the third month. As an exception it will be met with, not as a rule.

While watching the case and waiting for a diagnosis the rapid growth of the tumor becomes a sign of great value.

As to the differentiation of the varieties, I have little to say: first, because we know very little upon the point; and second, because the determination of it is of little importance as to treatment. If the gestation be tubal, spasmodic contractions will occur which will be absent in the abdominal and ovarian varieties; if it be interstitial, the uterus will enlarge as much as if the pregnancy were normal.

Physical Signs.—Some of these have just been given, but I deem it best for conciseness to repeat them here. The uterus is usually found enlarged, lifted up in the pelvis, and pressed forward or laterally by a tumor which exists posterior to it or on one side. This tumor is generally found to be sensitive upon pressure and bearing evidences of great hyperæmia, which gives a violet hue to the whole vagina. Its growth may be marked by daily changes. Such a tumor accompanied by (*a*) the gastric and mammary symptoms of pregnancy; (*b*) cessation of menstruation; (*c*) enlargement of the uterus; (*d*) the purple hue of the vagina; (*e*) evidences of ballottement; (*f*) colicky pains in the pelvis, with tendency to collapse after their occurrence; and (*g*) irreg-

ular bloody flow from the uterus,—would give good ground for diagnosis of ectopic gestation.

Differentiation.—The diseases with which extra-uterine pregnancy is most likely to be confused are—

Inflammation or abscess of the broad ligament;
Pelvic hæmatocele;
Retroversion or retroflexion of the gravid uterus;
Fibrous or fibro-cystic tumor;
Ovarian tumor;
Dermoid cyst;
Parovarian cyst;
Conception in a rudimentary horn of a double uterus;
Fluid accumulation in the Fallopian tubes.

Very often in the beginning it is difficult to decide whether the case is one of extra-uterine pregnancy attended by the usual uterine enlargement, or a case of normal pregnancy attended by some pelvic neoplasm. Under these circumstances a clear statement of the necessities of the case should be made to the family, and the uterine cavity thoroughly explored by rapid dilatation of the cervix and investigation by means of the finger. In inflammation or abscess of the broad ligament there are no signs of pregnancy and no disorders of menstruation, while both rational and physical signs will point to a condition of acute inflammation.

Pelvic hæmatocele gives no previous history of pregnancy, occurs with great suddenness, and, while sometimes a result of ectopic gestation, presents to the touch a tumor entirely different from that condition.

From posterior displacement of the gravid womb a diagnosis may be usually arrived at by placing the patient in the knee-chest position and very cautiously lifting the fundus.

Fibrous, fibro-cystic, ovarian, and parovarian tumors are not tender, present no symptoms of great pelvic hyperæmia, are usually painless, and give none of the grave symptoms attendant upon ectopic gestation.

The same remarks may apply to dermoid cysts.

From pregnancy in a rudimentary horn of a double uterus a diagnosis of ectopic gestation must necessarily be very difficult, and could be accomplished only by repeated and thorough examination under anæsthesia.

After all is said with regard to the diagnosis of ectopic gestation, it must be added that a positive conclusion is very generally difficult and often impossible. It is not uncommon to hear practitioners blamed for deaths occurring from rupture of ectopic fœtal sacs when no diagnosis had been made. Such censure is highly unjust and reprehensible. Diagnosis in these cases, even when suspicion is excited, is, as I have

said, usually difficult and sometimes impossible. Surely when suspicion is not excited by decided symptoms it is manifestly unjust to reflect upon the medical man who has had the misfortune to have the occurrence take place in his practice.

Causes of Death.—These may thus be summed up: shock, hemorrhage, septicæmia, exhaustion from hectic symptoms, peritonitis, perforation of important viscera by bones.

Treatment.—No one can to-day write authoritatively or dogmatically upon the treatment of ectopic gestation. Many points connected with it are still unsettled, and it will require years of careful observation and cautious consideration before they can be decided. The circumstances, too, which surround each individual case will have to receive due weight in the determination of the course which should be adopted in its management. The same rules which would, for example, apply to a woman suffering from this condition who is in contact with some medical centre where the most consummate skill can be obtained, a complete diagnosis made, and all the hospital advantages of our day put at her disposal, could not with advantage be followed in the case of one living in an obscure country district and deprived of such resources.

Upon one point in connection with this subject all will agree—namely, the fact that the death of the fœtus during the course of abnormal gestation in any part of its duration is an unqualified advantage. Previous to this occurrence intense vascularity constitutes at once the most striking feature of the condition and its most dangerous characteristic. After it a rapid diminution of this feature usually, though not always, occurs in the placenta, the uterus and its annexæ, and the entire tissues of the pelvis. Before it operative interference is for this reason much more hazardous than it is after it, and much more difficult of accomplishment.

Before entering into further considerations upon treatment, the fact must likewise be mentioned that prior to the twelfth week of gestation the fœtus is very apt to be found in the Fallopian tube, and thus the whole sac and its contents may be removed; that later than this time, either from displacement or laceration of the tube containing the fœtal ball, attachment of the placenta to some of the abdominal viscera will likely be met with; and that at full term the placenta is found attached to the anterior abdominal wall and in the line of abdominal incision once in every six or seven cases.

In deciding as to any special line of treatment, it must be borne in mind that while in the practice of obstetrics applied to normal gestation two lives have always to be prominently considered, here but one usually presses its claims upon our consideration; and this because of the great danger to the mother from an effort to save the child, and of the

slight probability which exists that success would attend an effort purchased at such a cost. I admit that in ectopic gestation which has advanced beyond the seventh month the child's life should be considered; but the cases of this character will be rare in comparison with those diagnosticated at an earlier period.

The views which I shall express upon this point are based upon an exceptionally large experience, and have been adopted after mature reflection; and yet I confess that I feel that fuller experience and deeper reflection may in time cause me to modify them. To lay them before the reader as fully as possible, I must divide my subject and consider treatment as applied to ectopic gestation after rupture of the fœtal sac; before the period of fœtal viability; and after the period of fœtal viability.

Treatment of a Case after Rupture of the Sac.—After rupture of the ectopic sac it may be supposed that laparotomy would be invariably indicated as the only procedure consonant with good surgery; but this is not the case. During the profound shock which very generally attends such rupture operation is of course impossible. After recovery from this the case should be carefully watched: if evidences of continuing hemorrhage, of tendency to prostration, of peritonitis, or of septicæmia exist, the abdomen should be promptly opened, the effused materials carefully removed, the pelvic cavity thoroughly cleansed, and the fœtal nidus extirpated or stitched to the abdominal wound, so as to allow of thorough drainage, as may appear most advisable to the operator in each individual case.

On the other hand, if, after rupture, the case progresses favorably, behaving like an ordinary one of hæmatocele, laparotomy should be avoided and the efforts of nature encouraged and relied upon. In my thirty-three cases I have had one of unquestionable sac-rupture entirely recovering under this plan, and it was in a woman whose nervous system rendered it very desirable that a capital operation should be avoided.

In such cases, however, I would decidedly favor prompt and early action, unless those circumstances which I recently mentioned as opposing resort to operation exist in so marked a degree as to render action more dangerous than delay, great as this is pretty sure to be.

I know of but two cases of recovery after laparotomy for rupture of an ectopic sac in this country. One of these occurred in the practice of Dr. Johnstone of Danville, Kentucky, and the other in that of Dr. Gordon of Portland, Maine. This fact ought, however, by no means to discourage the procedure, for without doubt the future opens to it a promise which, for manifold reasons, the past has failed to realize. The next decade will in all probability change the present record most decidedly for the better, but even if it does so, I do not believe that the conservative rule which I have here given will be annulled by that fact.

Treatment of a Case before Rupture and before the Period of Viability.—Should the diagnosis of extra-uterine pregnancy be pretty certain, and the patient's surroundings and position in life be such as to enable her to command a reliable operator and good nursing, if rupture appear to be imminent from the great distension of the sac and the frequency and severity of tubal contractions, resort should at once be had to laparotomy. The fœtal nest should after ligation be entirely removed, or, if this be impossible, it should be laid open by incision, its contents removed, the edges of the sac stitched to the abdominal wound, and complete and efficient drainage established.

On the other hand, should the diagnosis be doubtful, as such diagnoses so often are; should there be no reason for haste; should the medical attendants be men unfamiliar with abdominal surgery, and the hygienic surroundings of the patient be bad,—the life of the child should be promptly destroyed and the question of operation as to time and necessity be left for future consideration.

I would state the matter even more positively than this in the following way: Unless the imminence of rupture render fœticidal efforts hazardous and delay for this purpose unadvisable, the life of the fœtus should always be destroyed prior to fœtal viability, before laparotomy is resorted to. After fœtal death, from the very instant that it is accomplished diminished vascularity rapidly establishes itself, and every day, every hour, renders the chances of a subsequent operation better. If the pregnancy be in the early months—say, for example, in the first four—nothing further will usually be necessary in the way of interference. If it has advanced to the sixth, what evil will attend the destruction of fœtal life? In a fortnight after it laparotomy may be practised, and if it be so, how much greater would be the chances for a successful issue! Unless, then, there be some especial and weighty reason for immediate resort to laparotomy at this period, I would strongly urge the claims of fœticide either as a final resort or as a preparation for the future and more radical procedure.

Ectopic gestation with our present improved methods of diagnosis will henceforth be frequently discovered early. If so—not if a positive diagnosis be made, but if a strong suspicion exist that a child is developing outside of the uterus, whether in the tube, the ovary, the abdomen, or the uterine wall—a strong electric current should be passed through the suspected mass. Then the surgeon should watch for bad symptoms. If signs of septicæmia, septic peritonitis, or hectic fever show themselves, and if it be regarded as probable that the retention of the fœtal mass is the source of the trouble, laparotomy is as much at our disposal as it was originally, and will be attended by less danger.

Far be it from me to belittle exact diagnosis or depreciate any of its claims, but let me ask those who have seen these cases as frequently

managed at the bedside which course would appear to them the more dangerous—to expose the patient to a half dozen consultations, to explore the suspected mass with considerable force and to wait for light as to diagnosis, or to run the risk of passing a strong interrupted galvanic current through one of those masses which will usually offer themselves for differentiation from ectopic gestation—such masses, for example, as uterine fibroids, ovarian or parovarian cysts, phlegmons of the broad ligaments, or fecal tumors? If the diagnosis of ectopic gestation is correct, great good will at once show itself in improvement of symptoms and the danger to the patient will be greatly diminished; if it be incorrect, what harm will have resulted? If the period of infantile life be not too much advanced for absorption of the fœtal mass to occur with safety, the least hazardous exit from the difficulty will have been selected; should laparotomy become necessary at a later period, it will prove much safer after crippling of the placenta and diminution of the vascularity of the whole product of conception and of the parts surrounding it. Even if it were certain that laparotomy would become necessary in a few days or weeks, the danger of the operation would be greatly diminished by the use of the electric current. Cases of this nature, in which operation at or near full term in the child's interest has been resorted to, have been, and probably will be, rare, for few conscientious practitioners will feel warranted in exposing a mother to the dangers attendant upon months of waiting when the prospects of ultimately saving the child's life are so small.

As the matter now stands, the question arises whether, when a diagnosis is made at the seventh month of abdominal pregnancy, it is right to await the coming of the ninth, and then to operate with the slight chances of saving the child which appear to attend the procedure. I should be opposed to the plan of waiting, and should favor the performance of laparotomy at once.

There are several methods by which fœtal death may be brought about. I mention them in the order of my appreciation of their value: 1st, the galvanic or faradic current without acupuncture; 2d, the same with acupuncture; 3d, the aseptic evacuation of the liquor amnii by Dieulafoy's aspirator; 4th, the injection of morphia hypodermatically into the sac. Of these methods, I very decidedly prefer the first. So efficient have I found it in many trials of its power that I am led to the belief that it should supersede all others. The electric current with acupuncture might be necessary in the case of a six months' child of vigorous type, but the necessity of acupuncture even then should be admitted only after failure with electricity without it.

In my mind, this axiom should to-day be accepted as a rule in ectopic gestation prior to viability of the child: *A diagnosis of extra-uterine pregnancy being arrived at, destroy fœtal life as promptly as possible.*

Should the pregnancy have advanced to full term and the child die, as it always does at this time from the spurious labor which then occurs, the surgeon should quietly await indications for interference, feeling assured that as time passes the placenta is probably shrivelling and all the parts becoming less and less hyperæmic.

Should electricity fail to kill the fœtus, either from the feeble way in which the attendant inefficiently employs it or from some inherent want of power which I have not yet seen it develop, laparotomy should be promptly resorted to even in the early months of ectopic gestation.

Treatment of a Case after the Period of Fœtal Viability.—At this time it appears to me that it is the duty of the physician to consider the claims of the child and to give it a chance for life, even at the great risk for the mother which is involved in such a course. The laborious and conscientious labors of Dr. R. P. Harris of Philadelphia have placed upon record thirty cases operated upon under these circumstances by what is most inappropriately termed the primary operation. Harris' tables are given on pp. 194 and 195, and an examination of them will show that out of 30 cases, only 5 women and 22 children passed through the terrible ordeal with life, and many of the children delivered alive died within short periods after birth.

It must, however, be borne in mind that most, indeed nearly all, of these cases occurred before modern abdominal surgery, with its crowning glory antisepsis, came into existence, and that the mortality which attended them cannot be accepted as that which would attend them to-day. Then, too, let us reflect that were we now to accept the dogma that primary laparotomy under these circumstances should be abandoned, we would be closing the doors against future advance, future progress, and future triumphs in this field. The sad recital which Dr. Harris makes to-day may be replaced in the future by one correspondingly brilliant if we labor to that end. It cannot be so if we accept the worst issue which could come to us as a final and irretrievable one.

In support of this position I quote the statement[1] made by Mr. Tait of Birmingham, England, that he has performed three primary laparotomies with the brilliant results of "one death of a mother and no deaths of the children."

This is one of the unsettled questions of treatment of ectopic gestation to which I recently alluded as belonging to a class upon which I felt that I might change my mind with increasing experience. I trust that I may never do so, for to make such a change would be to accept the humiliating conclusion that with all its modern triumphs surgery had in this field utterly failed to improve upon the distant past.

It is needless to say that all these operations should be performed under the strictest antisepsis.

[1] *Amer. Journ. of Obstet.*, Mar., 1888.

Table of Primary Laparotomies, prepared by R. P. HARRIS, M.D.

No.	Date.	Operator.	Locality.	Age.	Number of Pregnancy.	Duration of Gestation.	Result to Woman.	Result to Child.	Remarks.	References.
1	Aug. 29, '13	Dr. Bruckert	Berlin	32	3d	9 months.	Died in 40 hours	Lived	Sac ruptured, and peritonitis before operation. Intestines could not be replaced. Death from peritonitis.	*Magazin für die gesammte Heilkunde*, Rust, 1819, Bd. iii. S. 1.
2	Dec. 7, '14	Dr. Dominico Novara	Porto Maurizio	38	5th	9 months.	Died in 33 days	Lived	Woman died of slow septicæmia.	*Journ. univer. des Sciences méd.*, 1816, t. iii. 119–124.
3		Dr. Mattfeld	Tübingen	24	3d	9th mo.	Died in 20 days	Lived	Woman died of subacute peritonitis. Placenta left in place in the iliac fossa.	*Neue Zeitschrift für Geburts.*, 1834, Bd. i. S. 134.
4	Mar. 1, '41	Dr. Hauff	Germany (?)	(?)	1st.	34 weeks	Died in 24 hours	Died in 50 hours	Placenta removed by tearing and cutting. Death from "collapse."	*Medicinische Annalen*, Heidelberg, 1842, Bd. viii. S. 439.
5	1852	Prof. Pietro Lazzati	Milan	(?)	2d	9 months.	Died in 29 hours	Alive, but did not respire.	Operation demanded by serious condition of patient.	*Manuele del Parto Mechanico ed' Instrumentale del Lovati*, Milano, 1854, p. 194.
6	Mar. 27, '63	Prof. Eugène Koeberlé	Strasbourg	39	3d	9 months.	Died soon after operation.	Died on 2d morning	Operation *in extremis*: prior existing peritonitis: hemorrhage from a tear in placenta.	*Gazette méd. de Strasbourg*, 1863, t. x. p. 160.
7	Apr. 21, '64	Dr. Robert Greenhalgh	London	40	2d	8 months.	Died in 32 hours	Died in a few minutes.	Operation performed *in extremis*.	*Medical Mirror*, Nov., 1864, p. 689.
8	Oct. 5, '72	Mr. John Scott	London	23	1st.	30 weeks	Died in 5 hours	Died on 2d day	Pulse 135; temp. 104.2° at operation. Death from heart clot.	*Trans. Obstet. Soc. London*, 1873, vol. xv. p. 309.
9	Aug. 14, '75	Mr. Thos. Rich'd Jessop	Leeds	26	2d	33–34 wks.	*Recovered*	Lived 11 months	Fœtus free in abdomen; no cyst. Patient in critical condition.	*Ibid.*, 1876, vol. xviii. p. 261.
10	Mar. 5, '76	Prof. Otto Spiegelberg	Breslau	36	2d	40 weeks	Died in a few hours.	Lived 3 months	Sac ruptured, peritonitis, pulse 148 before operation; placenta incised; severe hemorrhage.	*Archiv für Gynäkol.*, 1879, Bd. xiii. S. 74.
11	May 25, '77	Dr. Heywood Smith	London	32	4th	9 months	Died in 22 hours	Heart beat 30 to 40	Woman believed to have died of hemorrhage.	*Trans. Obstet. Soc. London*, vol. xx., 1878, p. 5; also by letter, 1887.
12	Nov. 5, '77	Dr. Henry Gervis	London	39	9th	36½ wks.	Died in 56 hours	Died in 6 hours	Woman died of hemorrhage.	*Brit. Med. Journ.*, vol. ii., 1877, p. 884.

13	Aug.	19, '78	Dr. Ernst Fraenkel	Breslau	34	3d	33½ wks.	Died soon after operation.	Died in 24 hours	Woman died from detaching placenta.	*Archiv für Gynäkol.*, 1879, Bd. xiv. S. 197.
14	May	29, '79	Prof. Carl Schroeder	Berlin	33	7th	34½ wks.	Died in 36 hours	Lived	Death from hemorrhage, in operation and on following day.	*Zeitschrift für Geburtshülfe und Gynäkol.*, 1880, Bd. v. S. 115.
15	June	29, '79	Dr. M. Hofmeier	Berlin	38	7th	8 months	Died in 36 hours	Lived	Woman died of hemorrhage.	*Ibid.*
15	Dec.	19, '79	Dr. B. Christian Vedeler	Christiania	40	4th	35 weeks	Died the next afternoon.	Died the next day	Patient had gonorrhœal endometritis, also peritonitis, at time of operation.	*Norsk Magazin for Laegevidenskaben*, Juni, 1880, T. B. 6te Hefte, S. 86.
17	Jan.	10, '80	Prof. C. C. Th. Litzmann	Kiel	29	2d	9 months	Died in 16 days	Died in 15 minutes	Signs of sepsis on 12th day, with repeated hemorrhages; placenta removed on 16th day.	*Archiv für Gynäkol.*, 1880, Bd. xvi. S. 362.
18	Jan.	31, '80	Mr. Lawson Tait	Birmingham	33	7th	9 months	Died on the 4th day.	Lived	Death attributed to "prolonged shock."	*Obstet. Journ. Great Brit. and Ireland*, Oct. 1880, vol. ii. p. 577.
19	May	11, '80	Dr. Henry P. C. Wilson	Baltimore	24	4th	9 months.	Died in 90 hours	Lived 18 months	Patient had high pulse and temperature; collapse; probably septic.	*Trans. Am. Gynecol. Soc.*, 1882, vol. vi. p. 461.
20	July	26, '80	Dr. W. Netzel	Stockholm	28	3d	9 months.	Died in 48 hours	Died in 48 hours	Placenta divided in operation, producing severe hemorrhage.	*Hygiea* (Stockholm), 1881, vol. xviii. p. 169.
21	July	9, '81	Dr. August Martin	Berlin	39	3d	7 months.	*Recovered*	Did not breathe, cord pulsated.	Fœtus had a large occipital encephalocele.	*Berliner klinische Wochen.*, Dec. 26, 1881, Bd xviii. S. 753–775.
22	July	13, '81	Dr. Giuseppe Beisone	Pinerolo, Italy	40	1st.	9 months.	Died on the 6th day.	Lived	Patient appears to have died of septicæmia.	*Gazetta Medica di Torino*, 1881, vol. xxxii. p. 553–557.
23	Feb.	15, '82	Dr. Hildebrandt	Königsberg	28	2d	9 months.	Died on the 10th day.	Lived	Woman almost moribund from peritonitis when operated on: sank slowly afterward.	*Berliner klinische Wochen.*, No. xxix., July 20, 1885, S. 465.
24	Oct.	3, '82	Dr. Hildebrandt	Königsberg	26	7th	34½ wks.	Died in 17½ hours	Asphyxiated, was not resuscitated.	Woman operated on *in extremis*, and died in collapse.	*Ibid.*
25	Nov.	4, '85	Prof. Lazarewicz	Kharkoff	27	2d	9 months.	*Recovered*	Lived 21 days	Cyst and part of placenta drawn out and pursed up in closing abdominal wound.	*Vrach*, St. Petersburg, 1886, vii., 76–115; *Repertoire universel de Nouvelles Archives d'Obstétrique et de Gynéc.*, 25 July, 1886, pp. 277–279.
26	Jan.	29, '86	Prof. A. Stadtfeldt	Copenhagen	29	1st.	9 months.	Died in 38 hours	Lived	Woman apparently died of internal hemorrhage.	*Hospitals Tidende*, Sept. 22. 1886, p. 889
27	Mar.	30, '87	Dr. Joseph Price, Phila	Camden, N. J.	37	5th	7½ mos.	Died in 14 days	Died in 4 hours	Sac ruptured, and peritonitis prior to operation. Woman died of hemorrhage.	Communicated by the operator, April 19, 1887.
28		'85	Dr. John Williams	London	30	2d	35th week	*Recovered*	Alive		*Brit. Med. Journ.*, Dec. 3, 1887.
29		'87	Mr. F. H. Champneys	London			7th mo.	Died in 11½ hours	Alive	Woman died of septicæmia.	*Ibid.*
30	Oct.	29, '87	Prof. Aug. Breisky	Vienna	30		9 months.	*Recovered*	Lived 20 days	Sac intraligamentous exsected	*Wiener med. Woch.*, 48, 49, 50, 1887.

I have not deemed it necessary, or in character with an essay of this kind, to go into details as to the various operative procedures alluded to. For these I would refer the reader to the many excellent treatises which exist upon these subjects, and especially to two recent ones—those of Drs. Doran of London and Greig Smith of Bristol.

Table embodying Results of Thirty-three Cases occurring in the Practice of the Writer.—The following table presents the method of treatment pursued and the results obtained in the 33 cases which have come under my observation: In 6, rupture of sac occurred; of these, 5 died and 1 recovered; 1 only of them was submitted to operation, and that ended fatally. In 8, laparotomy was practised, six times by myself, once by Dr. Briddon, and once by Dr. Lusk; 4 recovered and 4 died. In 3 cases aspiration was employed; all died, none recovered, but these occurred before the days of antisepsis. In one case elytrotomy was practised, and this recovered. In 12 cases, a little less than one-half of all the cases seen by me, exclusive of those in which the cyst had ruptured, electricity was employed as a fœticide; of these, all recovered, none died. In 3 cases, exclusive of those in which the sac had ruptured, an expectant plan was pursued; 2 recovered and 1 died. In all of these 3 cases fœtal death occurred from unassignable cause, and fœtal bones were extruded.

Of the whole 33 cases, 22 recovered and 11 died. Excluding the six cases in which the patients were first seen subsequent to rupture of the sac, four-fifths of the entire number recovered.

TUMORS OF THE BREAST.

By SAMUEL W. GROSS, M. D., LL.D.,

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Tumors of the breast are, next to those of the uterus, the most common of the new growths of the female sexual organs, and for this reason their study should prove as interesting to the gynecologist as it is to the surgeon. Unfortunately, few attempts have been made to base the clinical features upon the minute structure of mammary neoplasms, the majority of writers drawing their accounts from views expressed in prehistological days, so that their descriptions are not trustworthy. In my *Treatise on Tumors of the Mammary Gland*, published in 1880, I made the first systematic attempt to utilize modern histological researches in the investigation of the general pathology of neoplasms of the breast, and to apply the principles deducible from their anatomy and their life-history to their diagnosis and treatment. In the present article, instead of dealing in generalities, I have pursued a similar course, and have prefaced each form of tumor with a brief description of its histogenesis and its minute features, so that there should be no misunderstanding, and that a guide might be furnished to others who desire to enter upon this field of inquiry.

In order that all possible light may be thrown upon the etiology, course, and treatment of tumors of the breast, and that good material may accumulate for future analysis, I would suggest that the following points be considered by those interested in adding to our fund of knowledge upon the subject:

What influences has age, menstruation, marriage, childbearing, nursing, pregnancy, lactation, sore nipples, traumatism, badly-constructed corsets, and puerperal or ordinary mastitis upon their development? If supposed to arise from injury or inflammation, note what lesions these factors produced and the date of the appearance of the neoplasm. Describe the variety and course pursued by a tumor that may have appeared during pregnancy or lactation; and describe the course of any tumor that may have been modified by the breast undergoing involution. If there be a family history of inheritance, endeavor

to trace it to ancestors—if possible through more than one generation—and not merely to relatives, and state what organ was affected in the ancestor and the variety of tumor. Note the structure and clinical histories of tumors occurring in impubic subjects, and the same points in reference to carcinoma developed before the thirtieth year. Describe the nature of symmetrical growths, or of two or more tumors met with in one breast, and the development of carcinoma from an adenoma or an adenoid fibroma, and of a sarcoma from a fibroma. Trace all cases of cystic sarcoma, about the malignancy of which many writers are obscure. Ascertain as accurately as possible the dates of certain clinical signs, as invasion of the neighboring tissues, the associated glands, and the viscera, and the date of death when the disease pursues a natural course and when an operation has been performed. Note the date and seat of recurrences and metastases, and describe post-mortem appearances. Trace the histories of cases, particularly those of sarcoma and carcinoma, to ascertain how long the patient remains well. It need scarcely be added that these data will be useless unless the tumor has been subjected to minute examination by a skilled observer.

Classification and Relative Frequency.

Tumors of the breast include neoplasms and cysts, the former being new formations which tend to persist and increase, while the latter, as a rule, result from dilatation and retention of the secretion of the glandular apparatus. From the fact that the breast is made up of a dense connective tissue stroma in which the lacteal glands and ducts are intercalated, it is not very common to meet with a neoplasm in which the latter elements are not included in the growth. It is not proper, however, to regard tumors which contain both glandular and connective tissue constituents as examples of mixed growths, as one of these tissues must be subordinate to the other, thereby illustrating the rule of classification—*a portiori fit denominatio.* In the connective tissue series of neoplasms the lacteal glands usually remain passive, and as the tumor grows they may partially or entirely disappear. Instead of being newly formed and predominant, the secreting elements are merely accessory, and represent the remains of preëxisting glands, contained, but widely separated, in a fibromatous, sarcomatous, or myxomatous matrix. If it be desired to recognize the persistence of more or less modified glandular tissue, the term adeno, or adenoid, may be used; but to include these tumors under the species adenoma or some of its various synonyms, as adenocele, is manifestly incorrect, and serves to perpetuate ignorance as to the histogenesis and life-history of mammary growths. Pure clinicians are also responsible for the confusion which exists in regard to the epithelial

formations. Medullary, colloid, and atrophying carcinoma are so commonly confounded with soft sarcoma, myxoma, and contracting fibroma, and the converse, that these growths must continue to be examined anew. True adenoma, one of the rarest of neoplasms, is also in danger of being misunderstood in consequence of being described as epithelioma by Labbé and Coyne, Malassez and Deffaux, and other French writers. This is to be regretted, as epithelioma implies the structure of the growth as met with elsewhere. Even as a generic term it is most objectionable, unless carcinoma, which is also an epithelioma in the sense of its arising from epithelial elements, be designated atypical, carcinomatous, or infiltrating epithelioma, to distinguish it from adenoma, which would then be regarded as typical, noncarcinomatous, or circumscribed epithelioma.

In their histological construction many of the mammary tumors resemble the normal tissues. They differ, however, both in structure and texture from those of the matrix, so that the apparent likeness is mimetic. Hence, in their classification, instead of adhering to the modern custom of saying that they are formed upon the type or model of certain tissues, it is more philosophical to separate them in accordance with their origin from the secreting apparatus and periglandular connective tissue, and at the same time designate the tissue of which they are composed, making, however, a separate group of cysts. For these reasons I prefer the following combined genetic and anatomical classification :

A.

1. Typical neoplasms derived from the periglandular connective tissue, and constituted by mature or perfected connective tissue or its equivalents.	Fibroma, or fibrous tumor; Myxoma, or mucous tumor; Lipoma, or fatty tumor; Chondroma, or cartilaginous tumor.
2. Atypical neoplasms derived from the periglandular connective tissue, but representing embryonic or unripe connective tissue.	Sarcoma.
3. Typical neoplasms derived from the secreting elements, and composed of acini and ducts.	Adenoma, or glandular tumor.
4. Atypical neoplasms derived from the secreting elements, and composed of epithelium.	Carcinoma.

5. Typical neoplasms which are derived from, and composed of, higher structures.	Angioma, or vascular tumor; Neuroma, or nerve tumor.

B.

Cysts, which include the sacs due to obstruction of the ducts and the accumulation of the secretion of the lacteal glands, and cysts of new formation.

1. Cysts derived from the secreting elements, and due to the retention of the secretion from obstruction of the ducts.	Retention or glandular cysts.
2. Cysts due to the collection of fluid in the expanded and fused lymph spaces of the connective tissue.	Connective tissue or lymphatic cysts.
3. Cysts due to the formation of a sac around the embryro of the tænia echinococcus.	Hydatid cysts.

It will be observed that I have used the expressions typical and atypical, which are synonymous with homologous and heterologous of the older pathologists. In the typical growth a determined model is followed, so that there is a tumor-like reproduction of adult connective tissue or glandular elements. In the atypical neoplasms, on the other hand, the constituents either extend beyond their normal boundaries, or deviate in form, size, and grouping from the mature epithelial or connective tissue textures, and represent irregular proliferations.

The genetic classification of neoplasms has not met with general acceptance on the part of teachers of surgery, and many complain of the gradual abandonment of the division into benign and malignant, and find special fault with the term sarcoma, under which they say pathologists group tumors which possess the greatest possible diversity of clinical history. The term carcinoma, however, is open to the same objection; and many purely practical surgeons, in teaching that their benign growths are synonymous with adenoeeles, connective tissue, or noncarcinomatous neoplasms, and that the malignant growths are equivalent to the carcinomatous tumors of the histologist, hold a position which is no longer tenable. With the view of including a certain class of the noncarcinomatous group, which some clinicians recognize as being partially malignant, they have coined a new expression, and describe sarcoma as a semimalignant or recurrent growth; but this clinical classification is even worse than the other, since sarcoma, as may be seen in the section on that affection, is more infectious than

ordinary scirrhus, and only yields in point of malignity to medullary carcinoma. It may be said, however, that the nearer the structure of a mammary tumor approaches that of the physiological adult tissues, whether these be connective or epithelial, the more innocent is the growth, and that the more it departs from the normal standard, or the more atypical it is, the more malignant is the new formation. If the clinician wishes to retain his classification, he should base it upon the fact, disclosed by modern histological investigations, that tumors which originate from the connective tissue have their innocent, semimalignant, and malignant representatives, while those which are derived from the epithelial elements include semimalignant and malignant formations. Thus, in the former series fibroma, lipoma, and chondroma are absolutely benign; myxoma is semimalignant, because it exhibits a tendency to reproduce itself after removal; and sarcoma, as I have just pointed out, is excessively malignant. Of the epithelial series, the malignant nature of carcinoma is familiar to every one, while adenoma recurs once in every five cases.

Of the relative frequency of mammary tumors it is difficult to form an estimate based upon accurate and extended records, since surgeons, for the most part, report their cases merely as adenoid and cancerous. The following table of 995 examples, however, may prove useful in throwing some light upon this point:

Authority.	Carcinoma.	Sarcoma.	Fibroma.	Adenoma.	Cysts.
Billroth: *Chir. Klinik*, Zurich, 1860–67, and Wien, 1868, 1869–70, and 1871–76	245	19	19	1	3
Heineke: *Beitrag zur Statistik der Mammatumoren*, p. 1	131	8	4	1	
Kuester: *Langenbeck's Archiv*, Bd. xii. p. 616	28	6	9	..	3
Langenbeck: *Virchow's Archiv*, Bd. xviii. p. 51, and *Langenbeck's Archiv*, Bd. xxi., Suppt., p. 149	157	16	5	..	2
Rose: *Deutsche Zeitschrift für Chirurgie*, Bd. xiv. p. 169	64	9			
S. W. Gross: *Private Notes*	207	19	24	1	14
	832	77	61	3	22

Excluding cysts, which constitute only 1 out of every 45 tumors, it will be seen that of 973 neoplasms, 832, or 85.5 per cent., were carcinomatous, and 141, or 14.5 per cent., were noncarcinomatous. This, doubtless, is the true proportion, as I find that Bryant[1] records 400, or 83.16 per cent., of carcinomata, against 81, or 16.83 per cent., of adenoceles, which are equivalent, according to his views, to the noncarcinomatous growths; and Billroth[2] met with 375, or 85 per cent.,

[1] *A Manual for the Practice of Surgery*, 4th Amer. ed., pp. 769 and 773.

[2] *Die Krankh. der Brustdrüsen*, p. 134.

of carcinomata, against 65, or 15 per cent., of the connective tissue neoplasms.

As will have been noticed, lipoma, chondroma, and osteoma find no place in the table. While examples of fatty tumor, developed in the paramammary adipose tissue, are recorded by Warren,[1] Brodie,[2] Velpeau,[3] Cooper,[4] Roper,[5] and, more recently, by Billroth[6] and Bryk,[7] I am not aware of a single case of circumscribed lipoma occurring in the gland itself. Sir Astley Cooper[8] and Cruveilhier[9] have each described an instance of cartilaginous growth; but, in the absence of minute examination in the one and of a complete account in the other, the fact, to say the least, is very doubtful. Although Cooper's case was probably an ossifying chondroma, of which Lange[10] has recorded an example, Wacker[11] states that in the Pathological Institute of Rostock there is a specimen of true chondroma of the size of a hen's egg, made up of hyaline and fibrous cartilage, with here and there calcareous deposition. The partial transformation of fibrous and sarcomatous tumors into osseous tissue is not very uncommon, but a true osteoma has as yet not been observed. Bryk[12] has reported an example of petrified mamma, in which a deposit of calcareous salts had occurred in the stroma and caused atrophy of the acini and ducts. Of the neoplasms originating from and composed of higher tissues, Tripier[13] records two instances of amyelinic neuroma, while Bryant[14] briefly notes a vascular tumor of the mamma, and Image[15] and Conrad Langenbeck[16] have reported similar growths, which had extended, however, from the skin to the mamma itself. Hence, in speaking hereafter of the connective tissue neoplasms, I wish to be understood as referring to fibroma, sarcoma, and myxoma alone, and to these growths, along with adenoma, when alluding to the noncarcinomatous group.

The Evolution and Transformation of Mammary Neoplasms.

The development and growth, or evolution, of the new formations of the mamma include processes which are, on the one hand, purely theoretical, and, on the other, strictly practical. Whether of epithelial or connective tissue derivation, they all originate through the multiplica-

[1] *Surgical Observations on Tumors*, p. 228.
[2] *Lect. on Surg. Path.*, p. 271.
[3] *Traité des Maladies du Sein*, p. 247.
[4] *Illustrations of the Diseases of the Breast*, p. 67.
[5] *Holmes' System of Surgery*, 2d ed., vol. v. p. 267.
[6] *Op. cit.*, p. 45.
[7] *Langenbeck's Archiv*, Bd. xvii. pp. 576 and 580.
[8] *Op. cit.*, p. 47.
[9] *Traité d'Anat. Path.*, t. iii. p. 824.
[10] *Medical Record*, vol. ii., 1881, p. 161.
[11] *Inaug. Dissert.*, Rostock, 1884.
[12] *Langenbeck's Archiv*, Bd. xxv. p. 808.
[13] *Dict. Encyclop. des Sci. Méd.*, sér. 2, t. iv. p. 408.
[14] *Op. cit.*, p. 692.
[15] *Med.-Chir. Trans.*, vol. xxx. p. 109.
[16] *Nosologie und Therapie der Chir. Krankheiten*, Bd. v. p. 83.

tion or proliferation of the preëxisting cells of the lacteal glands or the stroma and their descendants, either through direct hyperplasia and the primary production of the typical forms of the mother tissue or after the model of embryonic tissue formation. The latter plays a more important rôle than the former, since through it nearly all the neoplasms may arise. Just as in the embryo all tissues originate from masses of indifferent formative cells which have proceeded from the primordial cell, so in this mode of the development of tumors the tissues arise from collections of small, round, indifferent cells, which resemble those of the embryo or those of granulations. In the next stage these cells are converted into the tissues of which the tumor is composed, and the type followed here is the same as that which prevails in fœtal development.

In the preceding section I divided the neoplasms of the mamma in accordance with their derivation from the glandular or periglandular constituents of the organ. While this view of their histogenesis is most simple, and involves the belief that epithelium alone produces epithelium, and that connective tissue arises solely from connective tissue elements, every one who is at all familiar with investigations in this direction is aware that the origin of some of the new growths is still, and will probably always be, a disputed point.

However interesting it might prove, my space will not permit me to examine the contradictory statements which prevail on the development of these neoplasms, and particularly the carcinomatous, and which involve the question whether a cell belonging to a certain class can be the offspring of a cell belonging to an entirely different system. For my own part—and my views are in accord with those generally taught, and are amplified in the sections on the different neoplasms—I regard the lacteal glands as the starting-point of adenoma and carcinoma, and the connective as the matricular tissue of the histoid or simple neoplasms. I by no means, however, restrict tumor formation to the continuous multiplication of the indigenous cells of the mamma, but regard the wandering cells as contributing their share in the production of the indifferent cells out of which the connective tissue growths originate and out of which the newly-formed stroma of carcinoma is produced. As will be pointed out in the section on the latter affection, I believe that the continuous proliferation and transplantation of the epithelium are quite sufficient to account for all the changes met with in the development and extension of carcinoma, without invoking the mysterious spermatic influence of Simon, the *action de présence* of the French, or the epithelial infection of the German school —a view strongly urged by Creighton[1]—through which the epithelium

[1] *Contributions to the Physiology and Pathology of the Breast and its Lymphatic Glands*, 2d ed., 1886.

is assumed to have acquired the property of transforming all cells with which it comes in contact into a likeness to itself.

Having once started, neoplasms increase by central growth or by the progressive multiplication of their own cells, as occurs in the connective tissue series and in adenoma, or by peripheral extension along the lymphatics or the perivascular sheaths of the bloodvessels, as is witnessed in carcinoma. In the first mode the tumor remains circumscribed and encapsuled, while in the second it infiltrates and destroys the adjacent tissues and is not enclosed by a fibrous membrane. Sarcoma, however, may extend along the bloodvessels and invade the adjoining tissues without its capsule being necessarily destroyed. Hence, during their further growth and extension carcinoma and sarcoma exhibit malignant attributes, as evinced, in the former, by the continuous growth of the cells into the coverings of the mamma and the subjacent structures, and by their transportation to the associated lymphatic glands and the viscera, where they proliferate and supplant the natural tissues; and in the latter by the same phenomena, with the exception of the conversion of the lymphatic glands into secondary growths. As these features will be fully discussed in the sections on the several growths, they need not detain us here.

Although the tendency of neoplasms is to persist unchanged and increase, yet a time comes when they are subject to the same diseases as are the normal tissues. Thus they may inflame, suppurate, ulcerate, and die, and they are liable to various degenerations, transformations, and infiltrations, as the fatty, caseous, mucoid, telangiectatic, colloid, pigmentary, and calcareous, which give rise to certain subdivisions, and to which I shall again have occasion to refer when discussing the individual growths.

From a histological as well as a practical point of view it is a matter of great interest to determine whether a mammary neoplasm ever so changes its original type that one which has remained innocent for a series of years finally degenerates into one of a malignant nature or one which possesses the structure of a carcinoma or a sarcoma.

Among French writers,[1] Verneuil, Houel, and Desprez adduce cases to prove the transformation of so-called adenoid tumors into carcinoma. Elsässaer[2] has described and delineated two examples of the conversion of adenoid fibroma into carcinoma; Rushton Parker[3] and Billroth[4] have met with a similar occurrence; and Klebs[5] states that fibrous tumors are very frequently the starting-point of cancer. I have myself

[1] *Bull. de la Soc. Anat.*, t. xliv. p. 285 et seq.

[2] *Virchow's Archiv*, Bd. lxxxii. p. 478.

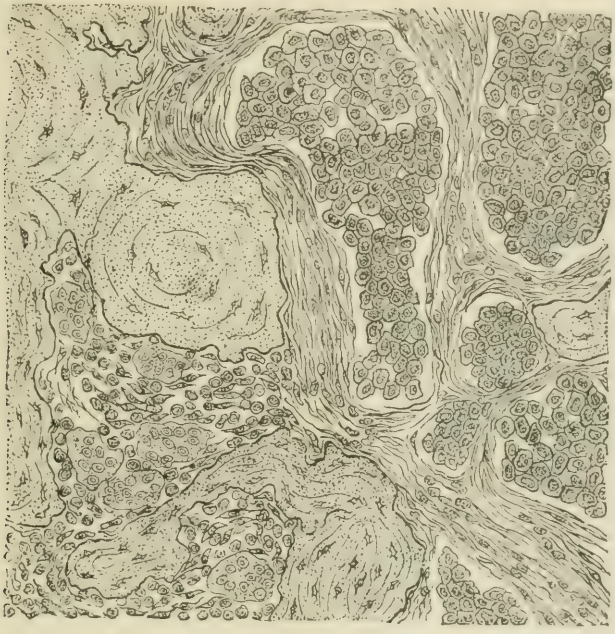
[3] *Trans. Path. Soc. London*, vol. xxxii. p. 233.

[4] *Virchow's Archiv*, Bd. xviii. p. 78, and *Die Krankheiten der Brustdrüsen*, p. 52.

[5] *Hdbch. der Path. Anat.*, Bd. i. p. 1207.

described[1] a very remarkable specimen of an adenoid fibroma, which was gradually being transformed into an osteoma when the irritation of the plates of bone excited an atypical growth of the cells of the acini, through which carcinoma was engrafted on it, as shown in Fig. 15. The tumor, which was three centimeters and and a half in diam-

Fig. 15.



Ossifying Adenoid Fibroma undergoing Carcinomatous Degeneration. × 250.

eter, densely hard, almost spherical and nodular, and enclosed in a fibrous capsule, was removed from a lady seventy-four years of age by Hunter McGuire, who kindly presented it to me. The patient remains well eight years after the operation. Von Hacker[2] has recorded a similar case, in which a cystic adenoma formed the matrix of the carcinoma. Sir James Paget[3] has pointed out that not only hard mammary glandular tumors, but certain ill-defined and tough, rather than hard, indurations, may become carcinomatous. The tendency of true adenoma to pass into carcinoma, as illustrated in Fig. 16,[4] from Formad, is so well established that it need not be dwelt upon ;[5] and it need scarcely

[1] *Medical News*, vol. i., 1883, p. 494. [2] *Langenbeck's Archiv*, Bd. xxvii. p. 614.

[3] *St. Bartholomew's Hospital Reports*, vol. xiv. p. 65.

[4] For this illustration, and others which I have credited to him, I am indebted to Dr. H. F. Formad. They are taken from his forthcoming *Manual of Microscopic Diagnosis*.

[5] Among the more recent descriptions of this transformation are two cases recorded

be said that the epithelium of the acini and ducts of these and of the so-called adenoid growths, as well as of the lobular indurations, is the point of departure of the transformation.

Billroth,[1] Labbé and Coyne,[2] Duplay,[3] and König[4] are of the opinion that the metamorphosis of fibroma into sarcoma is so frequent that primary sarcoma of the mamma is very rare; and this view would seem

FIG. 16.

Transformation of Adenoma into Carcinoma. The direct origin of the cancer cylinders from the epithelium of the ducts, through destruction of the basement membrane, is well demonstrated. × 250.

to be verified by the fact that a tumor which has remained of the volume of a walnut for fifteen years may in three months rapidly increase to the size of a double fist,[5] or attain the circumference of an adult head in a few months, after having existed, not larger than an egg, for eighteen years.[6] In a case of my own I removed a vegetating small spindle-celled sarcoma from a lady of sixty-five. At the age of twenty-five she accidentally discovered a tumor as large as a chestnut at the inner side of the right nipple. It remained of that size until the age of

by Meier in his *Inaug. Diss.*, Rostock, 1880, and the case of Lanzi, contained in *Lo Sperimentale*, March, 1882, p. 272.

[1] *Chir. Klinik*, Wien, 1871–76, p. 261.

[2] *Traité des Tumeurs Bénignes du Sein*, pp. 269, 283, and 363.

[3] *Traité Élément. de Path. Externe*, par Follin et Duplay, t. v. p. 628.

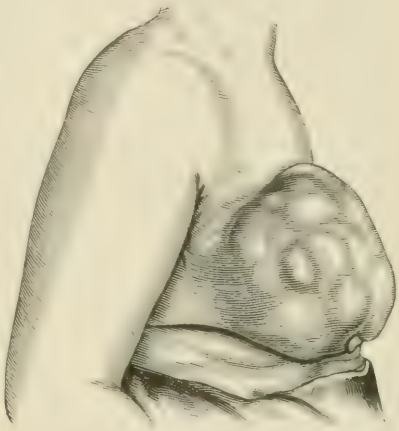
[4] *Lehrb. der Spec. Chir.*, 4te Aufl., Bd. ii. p. 89.

[5] Marignac: *Bull. de la Soc. Anat.*, t. lii. p. 428.

[6] Tillaux: *Thèse de Paris*, No. 194, 1880, par Cordier, p. 16.

sixty-one, when it began to grow, and during the past year had doubled its volume, so that it was larger than a fœtal head. Its gross characters are shown in Fig. 17, and the breast measured seven inches more than its fellow. A recurrent nodule was removed from the pectoral muscle at the expiration of seven months. Similar cases are referred to in the section on Sarcoma. In all such instances it would appear as if a fibroma had been converted into a sarcoma through multiplication of its cells and increased vascularization, although the opponents of a change of type might urge that a sarcoma may remain latent for many years, when, without obvious cause, it begins to grow rapidly through proliferation of its cells and a proportionate decrease of its fibrous intercellular substance.

Fig. 17.



Transformation of Fibroma into Sarcoma.

Tumors of the connective tissue and of the epithelial series may coexist in one or both mammæ. Thus, Richet[1] records an example of two fibrous growths, of twenty-two years' duration, in the lower segment, and a recent carcinoma in the upper segment of the same gland. Paget,[2] Rushton Parker,[3] and Kuester[4] have observed the coexistence of a single fibroma with a carcinoma in the same breast; and Waldeyer[5] met with a carcinoma and eight fibromata in one breast. Langhans[6] reports an adenoma, of nine years' growth, and a carcinoma, of six months' duration, side by side. The occurrence of fibroma and sarcoma in one breast has been recorded by Stilling[7] and Billroth,[8] and of fibroma and carcinoma by Kuester.[9] De Morgan,[10] Billroth,[11] and Bryant[12] have each seen a cystic sarcoma in one breast and a scirrhous carcinoma in its fellow, while in a case recently under my care I enucleated three fibromata from the right breast, and on total amputation of the left breast for scirrhus discovered that it also was the seat of three fibromata.

[1] *Le Practicien*, No. 14, 1879, p. 163.
[2] *Lectures on Surgical Pathology*, 3d ed., p. 565.
[3] *Liverpool Med.-Chir. Journ.*, No. 1, 1881, p. 212.
[4] *Verhand. der Deutschen Gesellschaft für Chirurgie*, Bd. xii. p. 288. Case xcvi.
[5] *Virchow's Archiv*, Bd. lv. p. 124.
[6] *Ibid.*, Bd. lviii. p. 147.
[7] *Deutsche Zeitschrift für Chirurgie*, Bd. xv. p. 253.
[8] *Op. cit.*
[9] *Ante*, Case lxxiv.
[10] *Trans. Path. Soc. Lond.*, vol. xix. p. 394.
[11] *Chir. Klinik*, Wien, 1871–76, p. 263.
[12] Private communication.

The Etiology of Neoplasms of the Breast.

The causes that determine the development of the new formations of the mammary gland are obscure, as will be seen in the sections on the various tumors, in which their etiology is fully considered. That they may arise from traumatism or inflammation is undoubted; but as the great majority cannot be traced to these antecedents, it is obvious that they are not necessary factors. That a mother may transmit to a daughter a peculiarity of structure of the component tissues of the breast which predisposes it to the occurrence of new growths cannot be denied. Beyond these statements we are utterly in the dark. Cohnheim's hypothesis of tumor development from persistent embryonic tissue is not only improbable, but has not been demonstrated. We know nothing whatever of the factors that excite the active growth of cells which constitutes the essential precursor of the outbreak of tumors. I am myself of the opinion that their development is connected with, or regulated by, the changed relations of the component tissues of the breast at different periods of life, and that the condition of the tissues is, as a rule, indicated by the age of the subject.

The noncarcinomatous growths occur, on an average, at the thirty-seventh year; only 41.21 per cent. develop after the age of forty, or when the physiological life of the mamma is beginning to be impaired;[1] 13.62 per cent. appear before the twentieth year, and 4 per cent. are met with before the establishment of menstruation. Previously to the age of forty, or during the period of the structural perfection of the gland, or when the proportion existing between the epithelial and connective tissue constituents is normal, fibromata and sarcomata are the most common of the neoplasms; or, if the epithelium be disturbed or excited, it reacts more in accordance with its physiological evolution, and adenoma results. When carcinoma occurs between the third and fourth decades, it signifies that the breast is prematurely old.[2]

The carcinomatous tumors develop, on an average, at the forty-eighth year; 81.20 per cent. appear after the age of forty; and they are never met with before the twentieth year. With advancing age the connective tissue stroma of the mamma preponderates, and, as it contracts, the lacteal glands, for the most part, atrophy and disappear through absorption of their cells, which have undergone fatty degeneration. If, however, instead of passing through these normal obsolescent pro-

[1] Although it is, if I do not mistake, customary to regard the mamma as being perfect up to the age of forty-five, when, on an average, the catamenial function ceases, I am of the opinion that the secreting structure begins to waste at forty, and that the stage of decline occurs several years earlier in feeble women.

[2] Atrophy of the lacteal glands now and then shows itself in early life through their failure to develop during pregnancy and through the absence of milk after parturition.

cesses, the contracting fibrous tissue produces irritative changes in the epithelial cells, the latter increase actively and abnormally, and lay the foundation of carcinoma. At this same period the fatty constituents of the connective are excessive, and, as Virchow has shown the parallelism between adipose and mucous tissues, if the fatty elements react instead of the epithelial, they revert to their original mucoid state, and a myxoma is developed.

It will thus be seen that age, or rather the anatomical arrangement of the stromal and epithelial constituents as indicated by the age, does exercise a most marked influence upon the kind of neoplasm to which the mamma is most liable. Arranging the cases upon which this section is based in accordance with the functional activity and physiological life of the mamma, there appeared—

	Fibroma.	Sarcoma.	Myxoma.	Adenoma.	Carcinoma.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
During the developmental period	7, or 7.29	4, or 2.70			
During the period of greatest activity	67, or 69.79	67, or 45.27	3, or 25	16, or 69.56	305, or 18.80
During the period of functional decline	22, or 22.91	77, or 52.02	9, or 75	7, or 30.44	1317, or 81.20
	96	148	12	23	1622

From these facts it is evident that the only tumors that develop before the sixteenth year are fibromata and sarcomata. It is further quite clear that between the sixteenth and fortieth years they are most common in the following order: fibroma, adenoma, sarcoma, myxoma, and carcinoma, and that after the age of forty the order is reversed, being carcinoma, myxoma, sarcoma, adenoma, and fibroma. In other words, structural perfection of the mamma renders it most obnoxious to fibroma, adenoma, and sarcoma, while atrophy or decay predisposes it to carcinoma and myxoma.

The Anatomy of the Connective Tissue Neoplasms.

The connective tissue neoplasms possess certain features in common which I shall consider, with the view of avoiding needless repetition, before discussing the individual growths of this series. Apart from the facts that they are usually round or ovoid, bossed, lobulated, or nodular on their surface, and invested by a fibrous capsule which separates them from the remainder of the gland, but with the latter of which they are frequently more or less closely connected, their coarse appearance on section indicates that they may be solid or cystic, the latter including the vegetating forms. Of the 270 cases that I have

studied, 148, or 54.81 per cent., were solid, and 122, or 45.18 per cent., were cystic, and, as a rule, vegetating or proliferous. Among themselves, however, they evince differences in their macroscopic features, since 63 per cent. of the fibromata are solid, and 37 per cent. are vegetating; 50 per cent. of the sarcomata are solid, and 50 per cent. are cystic; while 50 per cent. of the myxomata are solid, and 50 per cent. are vegetating. The cut surfaces of the solid tumors are smooth and unbroken. The cystic and vegetating forms, on the other hand, are pervaded by fissures, clefts, fluid cysts, or cysts containing solid growths; but as the cysts, whether they be barren, fluid, or solid, arise primarily in the same way, and as the clinical features of the cystic and vegetating varieties are essentially the same, I will, to avoid confusion, speak of solid and cystic tumors, including under the latter term the cystic and vegetating, as the vegetations merely represent a further stage of development of the solid growths.

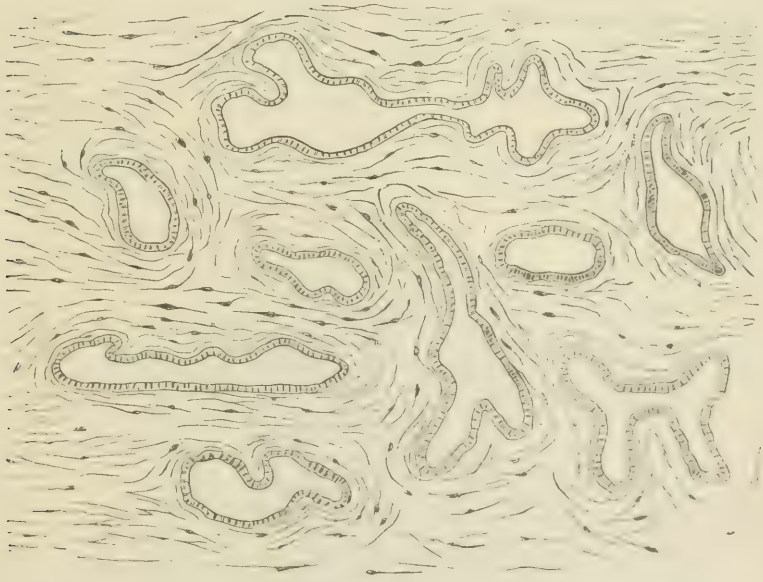
The solid connective tissue neoplasms, which constitute nearly 55 per cent. of the entire number, correspond, for the most part, to the noncystic adenoceles, adenomata, and mammary glandular tumors, and to those to which some authors prefix the term adeno, as minute examination discloses that the majority contain the remains of glandular elements, as is shown in Figs. 204, 205, and 209. These may be entirely normal, or the epithelium may have sustained changes in form and arrangement, or the acini may be dilated, or they may be undergoing obliteration, or, as I have witnessed in several examples, they disappear altogether. In addition to these features, there are very few specimens which do not contain enlarged and deformed ducts, which are the microscopic representatives of the irregular fissures, slits, or cysts that exist macroscopically in the cystic tumors. In one example out of every seven or eight they are, moreover, occupied by cystoid cavities, which are due either to fatty or myxomatous degeneration of their cellular elements or to fatty and mucoid changes of the irritated epithelium of the acini and ducts. In the former events the contents of the spaces, which have no epithelial lining, are yellowish, greenish, sanguinolent, or bloody, while in the latter they are serous, mucoid, or even pultaceous. Whether their origin be glandular or periglandular, they represent retrograde metamorphoses, and, although they may coexist, they must not be confounded with the true cysts of the second type of tumor, which represent a further stage of evolution and arise in an entirely different way.

The cystic connective tissue neoplasms, which embrace 45 per cent. of all cases, and which were formerly described as, or included under, the carcinoma hydatides of Sir Charles Bell, the vesicular scirrhus of Benedict, the hydatid or encysted tumor of Sir Astley Cooper, the tuberous cystic tumor of Cæsar Hawkins, the cystosarcoma simplex,

proliferum, et phyllodes of Johannes Müller, the serocystic tumor of Sir Benjamin Brodie, the proliferous mammary cysts and mammary glandular tumors of Sir James Paget, the cystoid adenoceles or adenomas of Birkett, the cystoide and papilläre drüsengeschwülste of Foerster, and the true cystic adenoceles of Bryant, are now termed, in accordance with the constitution of their stroma, cystic fibromata, cystic sarcomata, and cystic myxomata. When the cysts are barren of vegetations, the tumors are simply cystic or pericanalicular; whereas if the dilated ducts are filled more or less completely by intracystic growths, they are variously known as vegetating, arborescent, papillary, proliferous, endocanalicular, or intracanalicular tumors, and constitute 86 per cent. of all the cystic neoplasms of the mamma.

As was first demonstrated by Brodie and confirmed by Reinhardt, the cysts are due to ectasia of the lactiferous ducts, which are very apparent, even on the cut surfaces of growths not larger than a pullet's

Fig. 18.



Cystic Fibroma,[1] showing transverse and longitudinal sections of dilated and elongated ducts, to the undermost one of which acini are attached, lined by columnar epithelium. × 80.

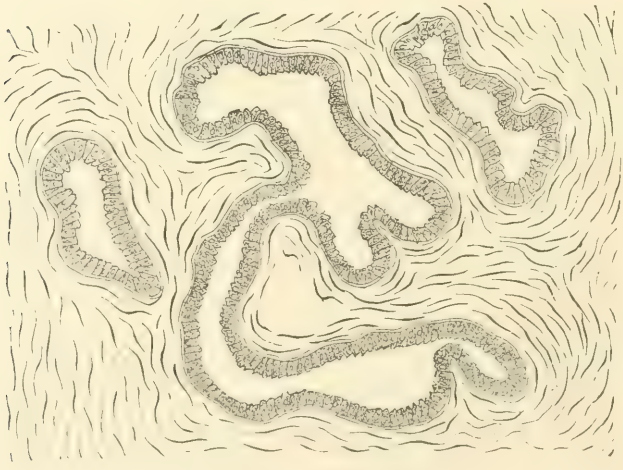
egg, as variously branched, tortuous, or intercommunicating fissures, slits, or clefts. In smaller growths, of the size, for example, of an almond, the initial steps of the change can be followed with the

[1] From a section of a fibroma of two years' duration which I enucleated from the upper and outer quadrant of the left mamma of a single woman twenty-two years of age.

microscope, which shows conclusively, as is represented in Fig. 18, that these fissures are nothing more than the ducts, and sometimes the acini, the walls of which have been mechanically disparted or drawn asunder by the eccentric growth of the peritubular and periacinous tissue of the neoplasm. In some specimens, even of large dimensions, when, in addition to enlargement of the ducts, there is progressive new growth of their membrana propria, the fissures are so stretched that they persist as such, their inner surfaces being merely moistened by a slight amount of clear viscid fluid. In others, again, through the accumulation of their contents, they assume the form of rounded or elongated and wide cavities, and may even contain as much as a quart of serous, mucous, lactescent, or sanguinolent fluid. In the majority of examples, however, the interstitial or pericanalicular tissue grows or projects into the deformed ducts as variously-shaped masses, as the papillary, clavate, dendritic, cauliflower, spheroidal, lobulated, or pedunculated, with broad or constricted bases. They are covered by glandular epithelium, which is usually round or cuboid, but may be distinctly columnar, and they may either lie loosely in the cysts or fill them entirely. These appearances are quite visible to the unaided eye, even in small tumors, or if they are apparently absent, they can be detected on minute examination, as is shown in Fig. 19, from Labbé and Coyne.

The microscopic features are coarsely followed in the larger neoplasms,

Fig. 19.

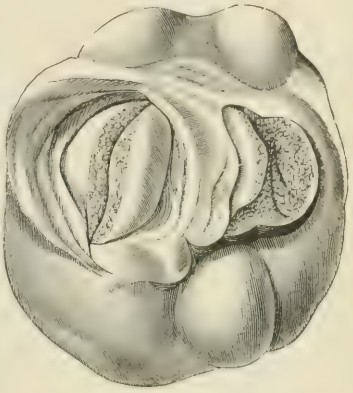


Cystic Fibroma, showing dilated ducts, the largest of which is occupied by incipient vegetations. ×70.

so that the intracanalicular projections are very evident to the naked eye, as in Fig. 20, from the Gross Museum. In other specimens, as in

Fig. 21, from the Gross Museum, they constitute pedunculated growths, which look not unlike miniature bunches of grapes, while in others section of the growth looks like that of a cabbage, as in Fig. 22, from Perls.

Fig. 20.

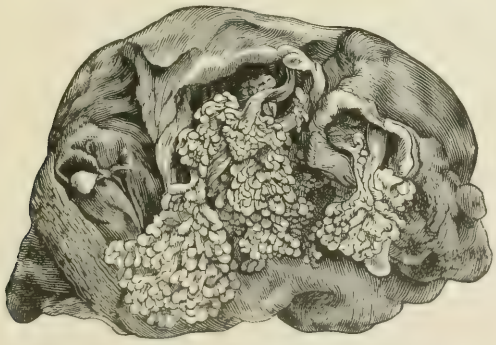


Intracanalicular Fibroma, exhibiting its lobulated arrangement and two dilated ducts containing tuberous growths laid open.

In their histological construction the intracystic growths do not differ from the remainder of the tumor, and, like it, they are liable to various transformations, as the telangiectatic, fatty, and myxomatous. Apart from softening cysts, they may themselves give rise to secondary cystic conditions, which serve to impress one with the idea that they contain glandular tissue. These cysts, which are in reality follicular or space cysts, or modified retention cysts, result from the compression and fusion of the surfaces of contiguous papillary vegetations at one or more points, so that the interpapillary spaces are converted into recesses or follicles, the epithelial lining of which secretes a mucous fluid.

Independently of these pseudotubular glands, the more tuberous vegetations now and then include preëxisting glandular structure,

Fig. 21.



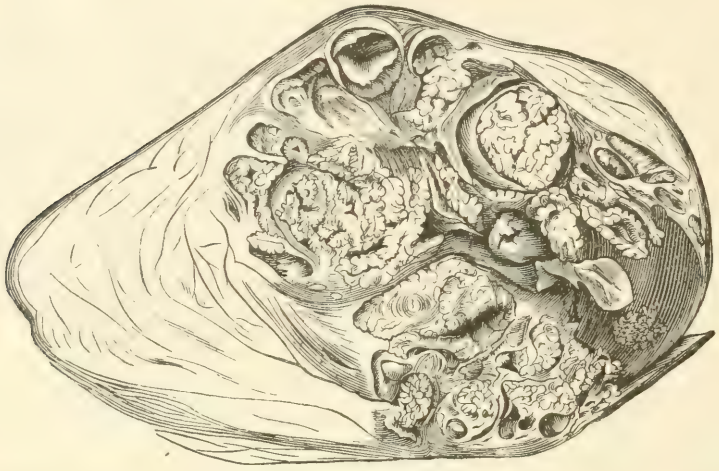
Intracanalicular Fibroma, showing lobulated masses dependent from long and narrow pedicles.

which is not only definable by the microscope, but is indicated by the dilated ducts which traverse them.

In addition to the solid ingrowths, the dilated ducts usually contain fluid of a mucoid nature, which may be bloody if the vegetations are very vascular. In quantity it may be scarcely more abundant than to

moisten the parts, or it may amount to many ounces and serve to increase the lobulated or nodular outline of the neoplasms of which it

FIG. 22.



Intracanalicular Fibroma, showing the ducts packed with vegetations, sections of which resemble the cut surfaces of a cabbage.

forms a part. Now and then it is discharged by the nipple, but rarely in large quantities.

The connective tissue neoplasms may be diffused or involve the entire mamma, as happens particularly in fibromata, when they constitute the affection called elephantiasis of the breast by Virchow, or, as it is usually known, general hypertrophy; or the morbid process may be, and generally is, restricted to a single lobule or to several adjacent lobules, when they are denominated tuberous, lobular, or circumscribed. The latter are invested with a capsule of new formation, which serves to distinguish them from the carcinomatous tumors, and which admits of their being moved about in all directions, although in many instances their deep surface is attached to the gland by a more or less broad pedicle, in which vessels or glandular tissue, or even cysts, can be detected. This is especially true of the fibromata and small sarcomata, so that, as I have not infrequently witnessed, a portion of the breast has to be removed along with the tumor. In such cases, if it happens that an operation be conducted during lactation, milk may be found in the imbedded lobules, as in an example of adenoid sarcoma recorded by Billroth;[1] or that fluid may be discharged by the wound, as in two instances of fibroma from the practice of Cras[2] and Cruveilhier,[3] and in one of recurrent spindle-celled sarcoma reported by Le Fort.[4]

[1] *Virchow's Archiv*, Bd. xviii. p. 68.
[2] *Bull. et Mém. de la Soc. de Chir.*, vol. iii. p. 13.
[3] *Ibid.*, p. 153.
[4] *Ibid.*, vol. ii, p. 487.

In the circumscribed or lobular neoplasms the remainder of the gland is, when the growth is voluminous, pushed aside, flattened, spread out, or even atrophied, although it now and then happens in sarcoma and myxoma that it is invaded by the rapidly proliferating tissue. It is also not very uncommon for the investing capsule and overlying tissues to give way and permit a portion of the mass to protrude externally.

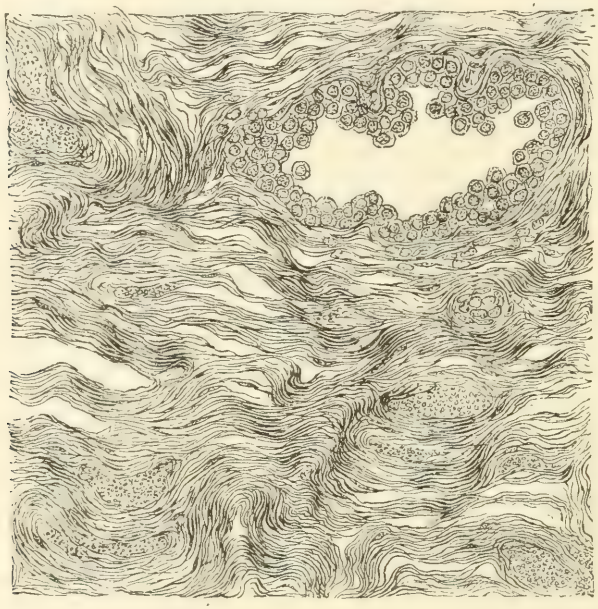
Fibroma.

Neoplasms composed of hyperplastic connective tissue, in which normal or variously altered preëxisting acini and ducts are sparingly interspersed, are classified as fibromata. From the persistence mainly of the acini, they are included by Birkett in his first group of adenomata or adenosarcomata, which he describes as being "compact, dense, firm, fibrous, lobulated, and invested by their own fibrous capsule;" and they are synonymous with the solid fibroid glandular tumors of Foerster, the adenomata with predominance of stroma of Broca, the corps fibreux of Cruveilhier, the chronic mammary tumors of Sir Astley Cooper, the pancreatic sarcomata of Abernethy, the adenoid tumors of Velpeau, the partial hypertrophies of Lebert, and the adenoceles of Bryant. That they form at least a part of the mammary glandular tumors of Paget is evident from the statement that the connective tissue was very abundant in most of the specimens he had examined. From the very frequent presence of preëxisting lacteal glands in their midst, Green, Duplay, Billroth, Erichsen, and Beck term them adenofibromata. Klebs and Ziegler recognize an almost pure fibroma and an adenofibroma; while Virchow, Rosenstirn, Monod, Cornil and Ranvier, Lannelongue, Tripier, Labbé and Coyne, Perls, and other modern investigators describe them merely as fibromata. The proliferous or vegetating variety, properly denominated cystic fibroma, is equivalent to the papilläre drüsengeschwülste of Foerster, the cystosarcoma fibrosum of Rindfleisch, the fibroma intracanaliculare of Virchow, the fibroma endocanaliculare of Labbé and Coyne, the cystoid adenoma of Birkett, the true cystic adenocele of Bryant, the proliferous mammary cyst of Paget, the hydatid or encysted tumor of Sir Astley Cooper, and the tuberous cystic tumor of Cæsar Hawkins.

Fibromata are circumscribed, spherical, rounded, or ovoid, and have a nodular, bossed, or lobulated outline. Their consistence is usually firm and elastic, or hard when they are not succulent, or unequal when the fluid contents of the cysts are in excess, in which event they are elastic or soft and fluctuating over the more prominent bosses, but firm elsewhere. On section they may be dry, white, nacreous, or opaque-white, dense, and compact, and cry under the knife, and the interlacing bundles of fibrous tissue may be arranged concentrically around centres

which project above the level of the cut surfaces. Minute examination of growths which present these peculiarities shows that they are composed of dense bundles of mature fibrous tissue, which is almost or entirely devoid of corpuscles, and that the small projections correspond to ducts and acini. This type corresponds, therefore, to the neoplasms formerly called fibroid or desmoid. In other specimens, as in Fig. 23, from Formad, bands of wavy connective tissue interlace in every

Fig. 23.



Fibroma. The newly-formed fibrillar connective tissue is loose and wavy, and transverse cuts of bundles of fibres are seen at many points. In the upper portion of the drawing is a duct in transverse section, the epithelium of which has undergone irritative hyperplasia. × 300.

direction. Such tumors are more or less juicy or moist, and of a glistening whitish, grayish-white, or rosaceous tint, and represent the majority of fibromata. In rapidly-growing examples the minute structure is that of recent connective tissue abounding in cellular elements.

The smallest vegetating tumors have a lobed appearance, while the macroscopic features of the larger ones vary in accordance with the transformations to which they are liable. Thus, while the mass of the growth may be firm and of a milk-white color, the vegetations are not infrequently softer and more transparent. When they are very vascular, their tint is rosaceous, or decidedly red, or red in lines, or even ecchymotic. A yellowish hue is indicative of fatty changes, while myxomatous degeneration is characterized by areas of gelatinous appearance.

Inflammation and suppuration of fibroma are very uncommon, and fungous protrusion was met with in only five of the one hundred cases which I have collated. It is interesting to note, from a diagnostic standpoint, that these were all examples of vegetating growths, and that the skin around the ulcer was normal as respects freedom from infiltration and adhesion to the protruding mass.

In a unique case recorded by Satterthwaite,[1] a proliferous fibroma protruded through the dilated orifices of the milk ducts without the intervention of ulceration, so that the nipple was surrounded by a mass of tissue which was eight lines high and looked like exuberant granulations.

The degenerations and transformations of fibromata are the cystoid, fatty, myxomatous, osseous, calcareous, and telangiectatic; but they are infrequent. In about 3 per cent. of all examples they are the seat of cysts, due either to fatty or mucoid transformation of the epithelium of the acini or to myxomatous change of the connective tissue. In addition to the latter, there may also be fatty metamorphosis, and in this event the growth may contain blood or extravasation cysts. In 4 per cent. of all cases, provided they are of many years' duration, the mineral salts are interspersed throughout limited portions of the mass, so as to impart to it the appearance of spongy bone; or they are aggregated into a densely hard concretion, which, as recorded by Cruveilhier,[2] may resemble in size and configuration the head of the femur; or, as in the case of Monteils,[3] they may form plates surrounding the fibrous tissue, some of which contain osteoblasts. Ossification is very uncommon, the only example of that occurrence of which I have any knowledge being one of a true spongy osteoma, as large as a pigeon's egg, contained in a cystic myxomatous fibroma removed by Leloir.[4]

Although they are, as a rule, only moderately vascular, fibromata undergo telangiectatic transformation in 6 per cent. of all instances, which is usually associated with rapid growth, and is indicated in one half of the examples by a bloody discharge from the nipple. In these cases of increased vascularity, which, as well as the calcareous degeneration, appears to be confined to the cystic fibromata, the vegetations are pervaded by large vessels, to the rupture of which may be ascribed the more or less transformed blood that is found in the dilated ducts and the hemorrhages which occur when they protrude externally.

Fibrous tumors of the mamma are usually solitary. Thus, of 100 examples, which include 24 of my own, only 15 were multiple, two growths being present in one breast in 5, one in both breasts in 5, two in both breasts in 4, and three in both breasts in 1. In the last case,

[1] *The Medical Record*, 1874, p. 635.
[2] *Bull. de la Soc. Anat.*, t. xlviii. p. 344.
[3] *Bull. de la Soc. de Chir.*, sér. 3, t. i. p. 472.
[4] *Gaz. Méd. de Paris*, No. 52, 1878.

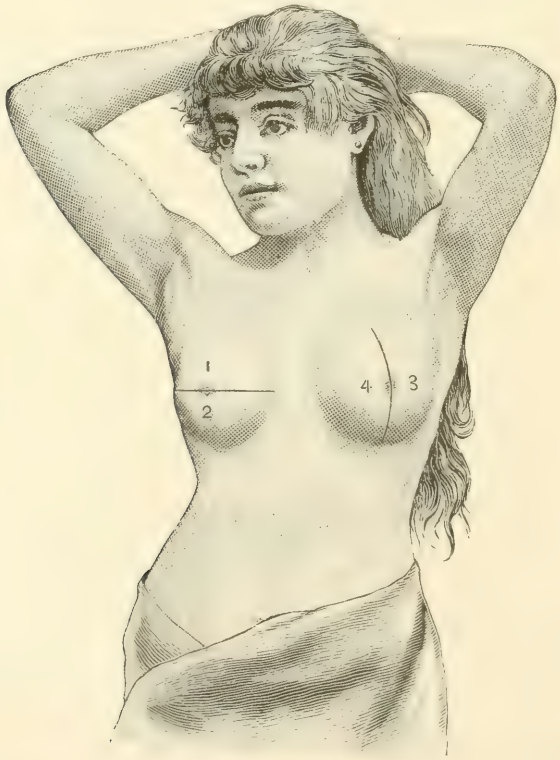
which was under my care in March, 1887, I enucleated three fibromata from the right breast which had existed, respectively, for twenty-four, five, and two years, and, after amputating the left mamma for carcinoma, discovered that, in addition to the malignant growth, it contained three small fibromata. The patient, who was fifty-one years of age, single, and still menstruated regularly, continues well.

When single they are, for the most part, peripheral, their favorite locality being the upper and outer portion of the left breast. Thus, of 85 cases in which the seat is noticed the tumor occupied—

The upper hemisphere in	14	The upper and outer quadrant in . .	10
The lower " in	9	The lower and " " in . .	4
The outer " in	10	The upper and inner " in . .	8
The inner " in . . .	9	The lower and " " in . .	5
		The vicinity of the nipple and areola in	16

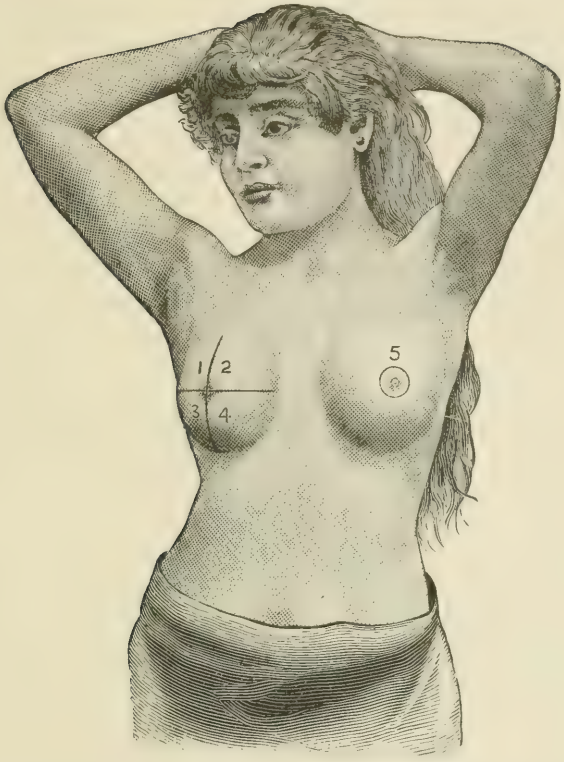
These regions are shown in Figs. 24 and 25.

FIG. 24.



1. Upper hemisphere. 2. Lower hemisphere. 3. Outer hemisphere. 4. Inner hemisphere.

FIG. 25.



1. Upper and outer quadrant. 2. Upper and inner quadrant. 3. Lower and outer quadrant. 4. Lower and inner quadrant. 5. Region of the nipple and areola.

Fibromata are generally quite superficial, and in rare cases, or once in every twenty-five, project beyond the level of the skin as pendulous or pedunculated growths.

They are met with as early as the seventh and as late as the seventy-fourth year, the average age of their first observation being 29.1 years, but they are uncommon before puberty and after the fifth decade. Of the 96 cases in which the age is noted—

19	appeared	between	10	and	19	years.	5	appeared	between	50	and	59 years.
36	"	"	20	"	29	"	1	"	"	60	"	69 "
18	"	"	30	"	39	"	1	"	at 7 years.			
15	"	"	40	"	49	"	1	"	at 74 years.			

Of the entire number, 7, or 7.29 per cent., occurred before the sixteenth year—namely, at the ages of seven, twelve, thirteen, fourteen, fourteen, fourteen, and fifteen, or during the developmental state of the mamma; 67, or 69.79 per cent., appeared between the sixteenth and fortieth years, or at a period when the breast and the

genital organs are functionally most active; and 22, 22.91 per cent., after the fortieth year, or during the period of their functional decline. It is, moreover, interesting to note that cystic fibroma develops later in life than the solid variety, since the average age at which the former was first noticed was 38.42 years, against 25.54 years for the latter. Hence it may be said that nonvegetating fibromata, which represent 63.54 per cent. of the entire number, are essentially outgrowths of the young and active mamma, while vegetating fibromata are outgrowths of the mature gland.

In the unique case of fibroma in childhood recorded by Dr. Hopkins[1] of Brooklyn a tumor as large as a chestnut was enucleated from the right mamma of a girl seven years of age. At the end of six months a small growth was noticed in the left breast, and two years later it had attained a diameter of one inch. At the expiration of five months the entire breast, with four large axillary glands, was removed. Sections of the growth examined by myself developed that it was made up of wavy fibrous tissue, in which were intercalated a few ducts.

Of the patients, 39 were single when the tumor was first observed, and 36 were married, while the social condition is not stated in the remainder. Of the married women, 20 had more than one, and 7 had one child, but 4 of these had never suckled; 6 were barren; and the question of children is not mentioned in 3. In 2 the disease developed during lactation.

Of 55 cases in which the menstrual function is recorded, 49 were regular, 5 were irregular, and 1 was the subject of metrorrhagia. 2 of the patients after the fiftieth year were menstruating, while of the young subjects it is certain that the catamenia had appeared in 1 at the age of fourteen. Assuming, in the remaining 6, and in 5 women after fifty years, that the menses had either not appeared or had ceased, it is evident that fibromata are developed principally during the menstrual epoch of life. These facts, when considered in connection with the statements concerning the social condition of the patients, demonstrate conclusively that neither celibacy nor disordered nor arrested menstruation is an important agent in their production.

In only 14 instances, or in about one in every seven, was the tumor traceable to injury. In 1 there was antecedent mastitis; in 2 the mothers of the patients died of mammary cancer; while in 1 it appeared to be transmitted from patient to child. In the last case, recorded by Puls,[2] the left breast of the mother was the seat of two vegetating fibromata, while two cystic tumors were present in the left breast of the daughter. The general health of the patients was, as a rule, excellent.

[1] *Boston Med. and Surg. Journal*, March 26, 1885, p. 290.

[2] *Virchow's Archiv*, Bd. xciv. p. 455.

The growth of fibromata is slower than that of the other connective tissue tumors, but it is very variable, and seems to be influenced by the presence or absence of vegetations. Of the solid variety, the smallest that I have met with attained a diameter of half an inch and a thickness of three-eighths of an inch in twelve months, and my experience shows that they rarely exceed the volume of a large walnut in three years. Even at the end of ten years they may be limited to that size,[1] or measure only three inches in diameter in eighteen years.[2] A breadth of an inch and three-quarters in six months is the most rapid growth that I have witnessed. The largest examples that I find recorded were of the size of a goose's egg in four years,[3] or of an adult hand and weighed three pounds and a half in five years,[4] or measured nearly twelve inches in length and weighed seven pounds in twelve years;[5] or had a circumference of twenty-two inches and weighed four pounds in twenty years;[6] or attained the volume of two fists and weighed upward of twelve pounds in twenty-one years.[7] On the whole, the rate of their growth may be computed at about two-thirds of an inch a year.

Cystic fibromata increase more quickly and acquire a larger size, as a rule, than the preceding variety. While it is true that they may require twelve months to reach the volume of a small chestnut,[8] or six months,[9] eighteen months,[9] two,[9] three,[9] and even four years[9] to attain the dimensions of a hen's egg, they grow, on the other hand, to the size of a double fist or fœtal head in two years and a half[10] or six years,[11] of an adult head in one year,[12] eight years,[13] or twenty-five years,[14] or have a circumference of twenty-nine inches and weigh eight pounds in six years,[15] or weigh twenty-nine pounds in seven years.[16] A peculiarity of their growth is that, while they may have been stationary or have progressed slowly for a long time, they suddenly, and without obvious cause, begin to increase rapidly, so that a nodule that has remained of the size of a walnut for five years and a half reaches the volume of a double fist in six months,[17] or a tumor which has taken twenty-four years to equal the size of an orange attains that of an adult head and

[1] Labbé et Coyne: *op. cit.*, p. 388.
[2] Muriel: *Trans. Path. Soc. London*, vol. viii. p. 384.
[3] Schuh: *Chirurgie und Operationslehre*, p. 311.
[4] Bull: *Illus. Quart. of Med. and Surg.*, vol. i. No. 4, p. 83.
[5] Paget: *op. cit.*, p. 564. [6] Monteils: *Bull. de la Soc. de Chir.*, 3 sér., t. i. p. 472.
[7] Cras: *Bull. et Mém. de la Soc. de Chir.*, t. iii. p. 13.
[8] Labbé et Coyne: *op. cit.*, p. 397. [9] *Ibid.*, pp. 448, 190, 131, 408, and 264.
[10] Demarquay: *Bull. de la Soc. Anat.*, t. xlii. p. 492, Paris, 1868.
[11] Labbé et Coyne: *op. cit.*, p. 259. [12] Lebreton: *Bull. Soc. Anat.*, t. xliii. p. 282.
[13] Heineke: *Beiträg zur Statistik der Mammatumoren*, p. 2.
[14] Labbé et Coyne: *op. cit.*, p. 270.
[15] De Morgan: *Trans. Path. Soc. Lond.*, vol. xxi. p. 352.
[16] Gherini: *Annali Univ. di Med.*, Feb., 1878. [17] Labbé et Coyne: *op. cit.*, p. 259.

weighs nearly six pounds in an additional year.[1] Under these circumstances the neoplasm will be found to be very vascular, or contain blood cysts or a large quantity of fluid. Hence the mode of increase is of importance as an aid in the diagnosis of the variety of fibroma, a slowly and regularly growing tumor indicating freedom from cysts and vegetations, and a suddenly and rapidly increasing tumor, with decided enlargement of its bosses, indicating the accumulation of fluid contents and intracanalicular vegetations.

It now and then happens that fibromata grow very rapidly during pregnancy, as in the case reported by Cras, while in about 4 per cent. of all examples they become larger and softer during the menstrual discharge and subside at its termination, and in 1 per cent. they become smaller and softer. In one case the tumor became harder and fuller just before the appearance of the menses, but returned to its former consistence and volume when the flow was established. In an instance recorded by Fergusson[2] it increased very rapidly after the menopause; while in a unique example reported by De Morgan[3] the breast suddenly doubled its size during a severe attack of gout in the toe, but returned to its original dimensions with the disappearance of the disease.

Throughout the entire life of fibroma, the skin, as a rule, remains mobile and normal in texture and color; the subcutaneous veins are not enlarged; the nipple is natural; the neighboring lymphatic glands are not enlarged; and the tumor is free from superficial or deep attachments.

To these general statements there are some exceptions. In three cases the skin was adherent, but to a limited extent only in two; in four it was red, and in one of these, at points, almost purple; while in five, as has been already mentioned, it ulcerated. The superficial veins were tortuous and dilated in five. The nipple was depressed in three. In two the neoplasm was so closely connected with the pectoral muscle that some of its fibres had to be removed with it; while in another it adhered firmly, by two prolongations, to the periosteum of the sternum. In two instances the lymphatic glands were enlarged.

In one case out of every seven of cystic fibromata there is a discharge from the nipple, but this symptom does not appear to be present in the solid form of fibrous tumor. In an example recorded by Labbé[4] a spontaneous, although scanty, escape of a whitish fluid preceded the detection of the new growth by two months, when it became bloody. In a patient under the care of Guyon[5] a sanguinolent discharge was induced by the pressure upon the breast, but it had ceased for several years before the tumor was extirpated. In a third case[6] there were several hemorrhages by the nipple during the rapid increase of the tumor or during the last month of its existence. In a case of

[1] Labbé et Coyne: *op. cit.*, p. 270. [2] *Trans. Path. Soc. London*, vol. iv. p. 353.
[3] *Ante.* [4] *Op. cit.*, p. 397. [5] *Ibid.*, p. 206. [6] Lebreton: *ante.*

my own a yellowish-brown fluid could be expressed, while in that of Watson[1] the discharge was spontaneous. In all of these examples the cysts were more or less completely filled with highly vascular vegetations, so that a bloody discharge is indicative of that condition.

In 35 examples of fibroma pain was experienced. Attention was, however, first called to the affection by suffering in only 3 of the entire number, while in the remainder it declared itself after the discovery of the tumor. In 20, or more than one-half, the pain was of an intermittent, severe shooting, darting, lancinating, or neuralgic character, while in 15 it was slight and evanescent, usually darting, but not infrequently dull and aching. In 9 it did not appear until the tumor began to increase rapidly; in 4 it was experienced only at the menstrual period; in 2 it grew worse at that time, and in 1 during lactation; while in 1 the pain was aggravated after the cessation of the catamenia. In the examples of ulceration of the skin and fungous protrusion the suffering was slight; in one, indeed, there was no pain at all, but the mass was exquisitely tender on handling. Including this case, only six were sensitive. In one of my own, a tumor not larger than a bean was, for the last three months of its existence, as intolerant of manipulation as a painful subcutaneous tubercle. It had existed for one year in the right mamma of a prolific female, aged forty-two, from whose left breast a similar growth was removed six years previously in Saxe-Weimar. In three examples the pain was neuralgic, paroxysmal, and severe, and radiated to the shoulder, base of the neck, axilla, and inner side of the arm. Not only were the tumors tender to the touch, but the mere friction of the clothing provoked suffering; while in one the patient was deprived of sleep, appetite, and the use of the corresponding arm. In none of these so-called *irritable tumors of the breast* did the growth exceed the volume of a small walnut. Hence, while it is true that amvelinic neuromata occur in the mamma, as has been demonstrated by Tripier[2] in two instances, it is highly probable that the small growths which excite so much suffering are composed essentially of indurated fibrous tissue comprising nerve filaments.

Recurrence of fibromata is met with once in every twenty-five cases. The most remarkable of these is that recorded by Rosenstirn,[3] in which a tumor of one year's standing, and seated in the left mamma of a prolific woman of forty-five, was enucleated in April, 1855. In March, 1860, a growth of six months' duration was removed from the right breast. Four additional tumors were extirpated from the left mamma in March, 1861, August, 1862, August, 1866, and September, 1869,

[1] *Trans. Path. Soc. London*, vol. xix. p. 386.

[2] *Dict. Encyclop. des Sciences médicales*, sér. 2, t. iv. p. 408.

[3] *Virchow's Archiv*, Bd. lvii. p. 166.

and two from the right breast in 1862 and 1869. They were all traversed by enlarged and deformed ducts. These illustrations of recurrence do not denote local malignity, but merely indicate that in some women there is a tendency to the formation of multiple fibrous growths, so that in these cases it was a question either of the further development of a nodule which was overlooked at the time of operation, or of the successive appearance of similar tumors in portions of the gland that remained behind. In all of these examples the growths were simply enucleated; but even when the gland has apparently been entirely removed it need not excite surprise if fibromata subsequently make their appearance, since outstanding lobules are sometimes disseminated throughout the entire mammary region, and even in the axilla, and may readily escape the eye of the surgeon.

Other evidences of the innocent nature of fibromata are the absence of enlargement of the associated lymphatic glands and of secondary deposits in the viscera. Their benignity was, moreover, demonstrated by the facts that they had existed, on an average, for five years and eight months before they were subjected to the knife, and that the total duration of life from their first observation to the date of the final reports averaged fourteen years.

Although they are not malignant, fibromata may, in their open and fungating state, prove destructive to life through profuse suppuration and hemorrhage, or through the injurious effects exerted upon neighboring organs. Thus, Foerster[1] describes a solid tumor, eleven inches long, eight broad, and four inches and a half in thickness, which produced absorption of a portion of the seventh rib, and penetrated the thorax, where, covered by the pleura, it formed a mass seven inches long, five broad, and three inches and a half thick, which rested upon the diaphragm, pushed the lung upward and completely compressed its lower lobe, dislocated the heart to the right, and curved the vertebral column to the opposite side.

The diagnosis of fibromata is based upon their indolent and insidious origin, their great mobility, peripheral situation, firm consistence, nodular or lobulated outline, slow growth, moderate dimensions for the period of their existence, freedom from alterations in the skin, nipple, subcutaneous veins, and lymphatic glands, slight liability to ulcerate and fungate and to a discharge from the nipple, slight tendency to be painful during their progress, and upon their greatest frequency between the sixteenth and fortieth years, or, on an average, at the twenty-ninth year.

The only tumors that exist prior to the sixteenth year are fibroma and sarcoma, the former being more than twice as common as the latter. The fibromata are always solid, while the sarcomata are cystic

[1] *Op. cit.*, Bd. ii. p. 481.

in three-fourths and medullary in one-fourth of all examples, so that a firm, solid neoplasm at that period of life is a fibroma and nothing else.

The distinction between the solid and cystic varieties may be made by attention to the following points: The former appear, on an average, at the twenty-fifth year; 11 per cent. develop before the age of sixteen, and 68 per cent. before the thirtieth year. They are uniformly firm or hard, never fungate, nor are they marked by a bloody discharge from the nipple. The latter are never seen before the sixteenth year; occur, on an average, at the thirty-fifth year; and only 40 per cent. originate before the age of thirty. Their consistence is unequal, being firm at points and soft and fluctuating at others; they are more largely and deeply lobulated, fungate once in every seven cases, and discharge by the nipple in an equal proportion of instances. Adhesion and discoloration of the skin, enlargement of the superficial veins, ulceration, depression of the nipple, and deep attachments, features which are uncommon in fibromata, if present, are characteristic of the cystic variety. Their growth is, moreover, sudden and rapid after having remained stationary or advanced slowly for several years.

The diagnosis between cystic fibroma and cystic sarcoma cannot in every case be absolutely made without a resort to the microscope, as they possess so many clinical features in common.

The treatment of fibroma is by enucleation from its capsule, the line of incision radiating from the nipple. If an involuting breast be the seat of several tumors, it should be excised, and the entire gland should be sacrificed if the growth be ulcerated. In women of fashion the scar may be hidden from view by adopting the practice of Gaillard Thomas.[1] When the tumor is of moderate volume, neither very small nor very large, that distinguished gynecologist makes an incision in the fold which unites the lower hemisphere of the breast to the thorax, through which that portion is dissected from its deep attachments, when an incision from the under surface of the breast admits of the removal of the growth. If the operation be aseptic, as all operations should be, and care be taken to drain the cavity left by the enucleation of the tumor, the resulting cicatrix will be scarcely apparent, especially as the greater portion of its extent will be concealed.

In recommending the removal of fibroma, I am not unmindful of the statement that it may disappear after marriage or during pregnancy or at the climacteric, but I cannot find the slightest evidence confirmatory of this assertion. Broca[2] regards compression as an efficacious measure, while other surgeons resort to sorbefacient plasters and unguents. These expedients I regard as not only useless, but as positively detrimental, as they may excite active growth. Nor do I favor the let-alone policy of some surgeons. As I have already pointed out,

[1] *New York Med. Journ.*, April, 1882, p. 337. [2] *Traité des Tumeurs*, t. ii. p. 462.

fibroma is liable to be transformed into sarcoma and carcinoma; and the cystic variety, if not removed in time, not uncommonly ulcerates, and protrudes large fungous, offensive, and bleeding masses. Then, too, a tumor of the breast, no matter what its nature may be, is always a source of anxiety. It is for these reasons that I advise an early operation, as it is the only means which will rid the patient of these risks and annoyances.

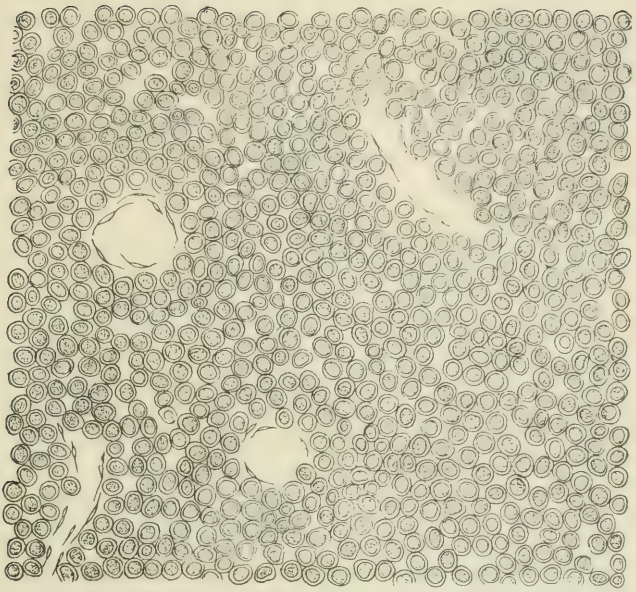
Sarcoma.

The term sarcoma has no histological significance, having been employed by Abernethy to designate a tumor "having a firm and fleshy feel;" but it is now used to indicate a new formation which has its physiological type in embryonic tissue and is composed of the undeveloped cells of the connective tissue series, separated by intercellular substance. From the excessive preponderance and grouping of the cells which endow it with its peculiar characters, and from their indisposition to develop into higher tissues, they constitute a structure which is unlike any mature tissue, and may therefore be regarded as an atypical connective tissue production, just as carcinoma is an atypical epithelial growth.

The histogenesis of sarcoma is very simple. In consequence of the irritation to which they are subjected, the fixed cells of the connective tissue stroma of the mamma proliferate, and are converted into an embryonic mass; this mass forms the indifferent, small-celled, or granulation tissue which constitutes the matrix of nearly all neoplasms. In alveolar sarcoma it is quite certain that the tumor starts from the endothelial cells of the lymph spaces, or elements which lie in the lymphatic system. This is shown by the fact that the glands of the axilla are infected in 66.66 per cent. of these cases, as against 68.07 per cent. for carcinoma, while in the other varieties of sarcoma invasion of the glands is met with in only 0.65 per cent. In addition to these nutritive disturbances, there is a new growth of vessels, so that there results a structure similar to that of granulations, out of which, through changes in the morphology of the cells and the character of the intercellular substance, the varieties of sarcoma originate. Hence, it will be seen that the textural modifications are the same, primarily, as those witnessed in ordinary granulation tissue.

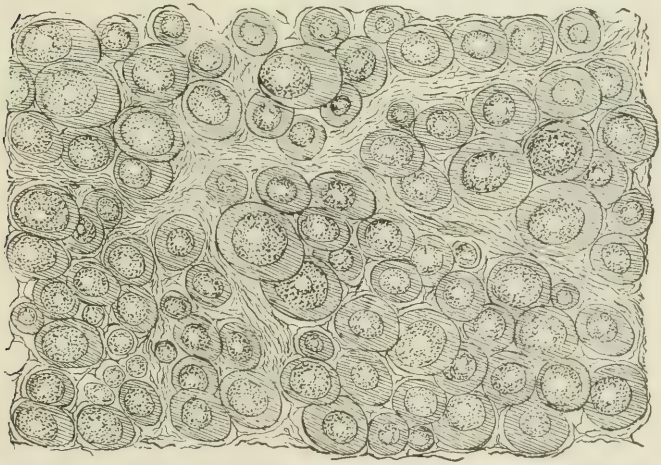
The varieties and subvarieties of sarcoma of the female mamma are the same as those met with in other organs. The principal ones—the spindle-celled, round-celled, and giant-celled—are determined by the prevailing form of the cells, and the first two are further separated, in accordance with the dimensions of the cells, into the small-celled and large-celled. The subvarieties are constituted by the nature or arrangement of the intercellular substance; by various transformations or com-

Fig. 26.



Small Round-celled Sarcoma,[1] showing a tissue composed of small round cells contained in an amorphous intercellular substance. Sections of four vessels indicate that they are mere channels with embryonic walls. × 400.

Fig. 27.



Large Round-celled Sarcoma. The cells measure up to the $\frac{1}{300}$ of an inch, and their protoplasm is largely hyaline, which is represented striated in the drawing. The nuclei are also large. × 400.

binations with other neoplastic tissues; by the presence or absence of duct or retention cysts; and by the persistence of glandular elements.

[1] From a section of a tumor, of five months' duration, which had invaded the right mamma of a spinster thirty years of age, and was as large as a double fist. Its consistence was tense and fluctuating, and the skin was adherent and livid over its most

Hence, the modified forms of sarcoma are the fibrous, lymphoid, alveolar, myxomatous, cartilaginous, osteoid, calcifying, melanotic, telangiectatic, hemorrhagic, cystoid, solid, cystic, and adenoid.

1. Round-Celled Sarcoma.—The structure of round-celled sarcoma, which is equivalent to the globocellular sarcoma of Virchow,

Fig. 28.

Lymphoid Sarcoma,[1] showing in its upper two-thirds the characteristic lymphadenoid structure. × 240.

embryoplastic tumor of Robin, the medullary sarcoma of Müller, the granulation sarcoma of Billroth, and the encephaloid sarcoma of Cornil

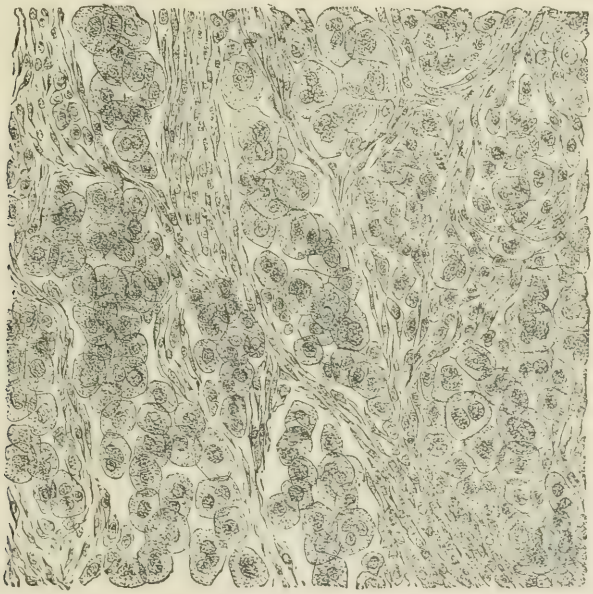
prominent portion. After removal the tumor was found to be almost entirely converted into a large cyst, which contained ten ounces of a citron-colored fluid rich in cholesterin. Despite the fact that I removed the entire breast with the invaded skin and pectoral fascia, the disease recurred in the skin and adipose tissue in three months.

[1] From a 3-para thirty-one years old, recorded by Billroth, in whom, during her third pregnancy, both breasts underwent sarcomatous degeneration, and death ensued, without operation, in six months and a half from the first appearance of the disease.

and Ranvier, is usually composed mainly, as is seen in Fig. 26, of fragile spherical cells of the size of lymph corpuscles, and provided, as a rule, with a single round or ovoid nucleus, which is large when compared with the protoplasm of the cell, and held together by a scanty, soft, amorphous, dimly granular, or finely fibrillated intercellular substance. Numerous large but delicate vessels pervade the tissue, and are very liable to rupture. In other, but rare, specimens the cells are of large dimensions, and are provided with correspondingly large nuclei, as in Fig. 27, from Formad. From these general features there are some histological variations whereby certain subdivisions are constituted.

α. Lymphoid Sarcoma.—When the intercellular substance forms a delicate reticulum of hyaline fibres, the meshes of which are occupied

Fig. 29.



Alveolar Large Round-celled Sarcoma,[1] showing active proliferation of the endothelial cells of the lymph spaces. The alveoli, which are merely distended lymph spaces, are separated from one another by trabeculæ of young connective tissue. × 400.

by small round cells, as in Fig. 28, from Billroth, so that the structure resembles the cytogenous or adenoid tissue of the lymph follicles, the tumor is known as lymphoid or lymphadenoid sarcoma.

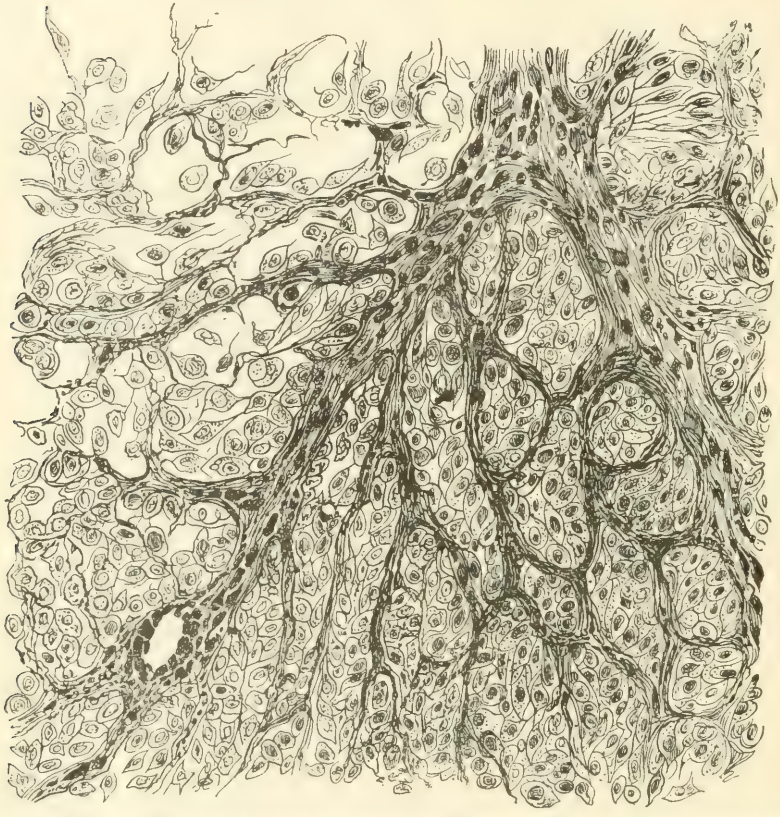
β. Alveolar, or Endothelial, Sarcoma.—A still greater departure from

[1] From a section of a soft tumor of nine months' duration, removed by Agnew from a multiparous married lady fifty-three years of age. The subcutaneous veins were somewhat enlarged, but the skin, nipple, and axillary glands were normal. The disease recurred in the cicatrix in two months, increased rapidly, was painful and occasionally bled, and death ensued suddenly three months and a half subsequently.

the ordinary type is occasionally met with, the cells, as shown in Fig. 29, from Formad, being contained within the alveoli of a connective tissue meshwork, through which it bears a close resemblance to carcinoma, but from which it differs by the cells being intimately connected with the walls of the alveoli or the vessels which form the alveoli. The cells themselves are derived from the endothelial cells of the lymph spaces, the latter of which are distended to form the alveoli.

γ. *Melanotic, or Pigmented, Sarcoma.*—Among the round-celled sar-

FIG. 30.



Melanotic Alveolar Sarcoma,[1] showing pigmentation of the trabeculæ of fibrous tissue, the cells being rarely affected.

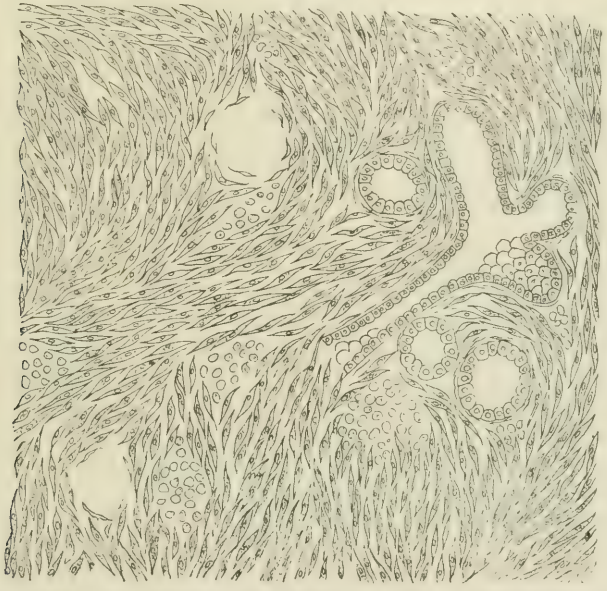
comata may be included those tumors which are characterized by the deposition of black granules of melanin or altered hæmatoidin in the cells, intercellular substance, or in the fibrous trabeculæ, as in Fig. 30, from Billroth, or in all of these constituents of the growth. In the

[1] From a section of a tumor, of three years' duration, removed by Billroth from a 10-para, sixty-eight years old. The skin was adherent and the axillary glands were infected. Death ensued, without local recurrence, in rather less than a year after the operation.

descriptions of the minute features of this rare subvariety round cells predominated and the stroma was alveolated.

2. Spindle-celled Sarcoma.—Spindle-celled sarcoma, which is synonymous with the fasciculated carcinoma of Müller, the albuminous sarcoma of Gluge, the fusocellular sarcoma of Virchow, the fibro-nucleated tumor of Bennett, the recurrent fibroid tumor of Paget, the fibroplastic tumor of Lebert, the plasmoma of Follin, and the fasciculated sarcoma of Cornil and Ranvier, has its pathological prototype in recent cicatrices, and is made up of fusiform cells, which vary greatly in size, as is shown in Figs. 31 and 32, although they are usually

Fig. 31.



Small Spindle-celled Sarcoma,[1] showing the spindle-celled tissue, in which are intercalated four ducts lined by low columnar epithelium. One of the ducts, with its terminal acini, is seen in longitudinal section. Some of the cells are cut transversely, and for that reason appear round. The two capillary blood-vessels in the left half of the section are mere channels without distinct walls. × 400.

small, that is to say, short and narrow, and provided with a single ovoid nucleus. The intercellular substance is generally very scanty, and the tapering extremities of one cell are received between the bellies of two contiguous cells, forming a tissue which is composed of bands or fasciculi of closely aggregated cells: these cells interlace in every direction, so that a section discloses longitudinal, oblique, and transverse bundles, the last of which may be mistaken for round or oval cells.

3. Giant-celled Sarcoma.—Giant-celled sarcoma is composed, as is seen in Fig. 33, from Billroth, of large multinucleated elements,

[1] From a section of the tumor delineated in Fig. 35.

imbedded usually in a stroma of spindle and round cells, with the intervention of little, if any, visible intercellular substance. The tissue has

FIG. 32.

Large Spindle-celled Sarcoma:[1] *a*, *a*, *a*, transverse sections of spindle-cells. The cells are all highly granular, and vary in form, without departing materially from the usual shape.

FIG. 33.

Giant-celled Alveolar Sarcoma,[2] showing the enormous cells and the alveolar arrangement of the fibrous stroma.

therefore an apparently alveolar construction, which is the more strik-

[1] From the margin of a section of a tumor of less than two months' standing, removed, along with the entire breast, by Nancrede from a married and prolific woman thirty-five years of age. The skin was discolored and false fluctuation was so distinct that the growth had been punctured a few days previously under the supposition that it was an abscess. The tissue was almost diffluent and highly vascular.

[2] From a tumor of a few months' duration, extirpated by Billroth from a multipara forty-two years old. In two months infected glands were removed, and in two additional months a recurrent nodule near the cicatrix of the first operation was excised. The disease again attacked the axilla, and the patient died of erysipelas from the last operation. Secondary growths were not found post-mortem.

ing when the cells have undergone mucoid softening or are obscured by advanced fatty changes.

Apart from distension of the ducts, which gives rise to cystic sarcoma, the glandular structure of the mamma persists, to a greater or a lesser extent, in only one-third of all specimens of sarcoma, and then principally in the spindle-celled growths, which are denominated *adenoid sarcomata*, and which rarely attain a considerable volume before their removal. In none of the specimens which I have examined did the endothelial cells of the membrana propria participate in the proliferation, so that that structure remained intact, although it may be thickened, or, as more frequently happens, attenuated.

Mucoid transformation of the matrix, fatty infiltration of the cells, increased vascularization, the presence of cartilage, earthy salts, or of bone in the intercellular substance, and of connective tissue of new formation, constitute the subdivisions of sarcoma known as the myxomatous, lipomatous, telangiectatic, chondroid, calcifying, osseous, and fibrous, so that these terms may be employed as prefixes to denote the nature of the changes that have ensued, or designate the existence of certain subordinate tissues. The term cystic is employed to indicate dilatation of the ducts, while cystoid is prefixed to the tumor when it is the seat of softening cysts.

Of the varieties of sarcoma, the spindle-celled, which include the fibrous, constitute 68 per cent., the round-celled 27 per cent., and the giant-celled 5 per cent. of all cases.[1] Of the subdivisions, 50 per cent. are cystic, the term including the barren and proliferous cysts; 50 per cent. are solid or noncystic; 33 per cent. are adenoid, the glandular structures persisting principally in the spindle-celled growths; 12.80 per cent. are myxomatous, the combination being almost peculiar to the spindle-celled and cystic tumors; 7.69 per cent. are telangiectatic and hemorrhagic; 7 per cent. are cystoid, or the seat of softening cysts; 2.56 per cent. are osteoid; 2.56 per cent. are calcifying; 1.21 per cent. are cartilaginous; 1.92 per cent. are alveolar; 1.21 per cent. are lymphoid; and 1.21 per cent. are melanotic or pigmented.

Like the other encapsuled neoplasms of the mamma, circumscribed sarcomata are ovoid, rounded, or spherical, lobed or bossed, and seldom smooth and uniform, the surface irregularities being most marked in the cystic variety. As a rule, they are unattached to the gland, but push it aside, compress, and flatten it, or cause it to atrophy, although they are, in rare instances, united to it by a pedicle. Their consistence

[1] Of the 19 cases that have come under my personal observation, 13 were spindle-celled and 6 round-celled. Of the former, 5 were firm, small adenoid growths; 1 was a telangiectatic and myxomatous, and 1 a myxomatous medullary sarcoma; 6 were firm cystic, and in 2 of these the cysts were filled with vegetations. Of the 6 round-celled, 1 was lymphoid, 1 was a myxomatous cystic medullary growth, 2 were proliferous cystic, and 1 of these was medullary, and 2 were cystoid medullary tumors.

varies with their minute structure and degenerations, the pure spindle-celled and giant-celled tumors being firm, like fibromata, while the round-celled are soft and elastic. The spindle-celled, however, are soft in about one-third of all examples, when they will be found to be composed of small fusiform cells, or to have undergone myxomatous or fatty transformation, or to be the seat of interstitial hemorrhage. The round-celled are hard in about one-sixth of all cases, when they will usually be found to be rich in fibrous intercellular substance. In one of the best illustrations of round-celled tumors that I have ever seen the tissue was dense, so that they are by no means synonymous with soft, medullary, or encephaloid sarcomata, although they are usually much softer than the spindle-celled variety, since they are peculiarly rich in cells and bloodvessels, and since their intercellular substance is usually mucoid. The spindle-celled growths sometimes creak or cry under the knife, in which event they come under the category of fibrous sarcomata, from the large admixture of fibrous tissue. Their consistence varies, moreover, with their stage of development. If they are solid, it is entirely or almost uniform; while they are soft and elastic or soft and fluctuating at some points, and especially at the larger bosses, and hard at others, when they are the seat of cysts occupied by fluid or solid contents, or by both. In about one-fourth of the cystic growths, however, the tumor is firm throughout, in consequence of the cysts being so deeply seated as to elude detection by manipulation.

On section the spindle-celled tumors are usually smooth, succulent, and glistening, and of a white or grayish-white color, particularly if they are poor in vessels, the tint being rosaceous white or rosaceous gray when their vascular supply is larger. The round-celled tumors, on the other hand, are rarely pure white, but, from their relatively greater vascularity, reddish-white, reddish-yellow, or reddish-gray, the hue being not infrequently comparable to that of the fœtal brain. When they are highly vascular the rosaceous tint is very marked, or they are pervaded by macroscopic vessels, or dotted with minute spots of ecchymosis, or patches or streaks of bright red or brown, or various intermediate shades of pigmentation. In not a few instances the soft brain-like tissue is so extensively interspersed with clots of blood and with tomentous cysts containing blood that the term hæmatoid or hemorrhagic sarcoma is not inappropriately applied to them, or the term fungus hæmatodes when they protrude through the skin. A pronounced yellowish color indicates fatty metamorphosis, which may pervade almost the entire tumor, or be confined to limited areas or to the vegetations alone, while the remainder is white or gray, thereby imparting to it a mottled aspect. A yellowish tint also denotes myxomatous changes, so that, as in the former instance, the mass of the

growth may be white or rosaceous white or rosaceous gray, and the vegetations be yellow. On the whole, however, gelatinous spots dotting the surface of the section are the best characteristic of this change. Now and then, or when great vascularity and the fatty and myxomatous degenerations are combined, there will be areas of yellow and red and spots of brown pigmentation, along with gelatinous dots. In point of fact, the color is so variable that it is extremely difficult to give an intelligible description of it. It need scarcely be added that melanotic sarcomata are pervaded by areas of dark-brown or black pigmentation. The cut surfaces of many of the largest specimens have also a lobed appearance from the close packing of the vegetations in the enlarged ducts which play the part of capsules.

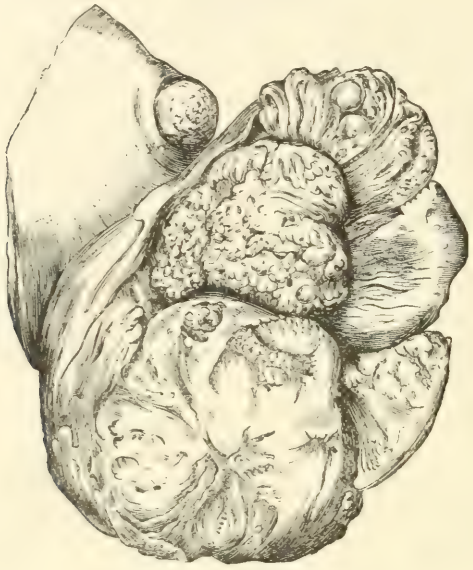
The gross characters of the smaller tumors, which correspond to the adenoid sarcomata of Billroth, and which do not grow larger than a walnut in seven or eight months, are worthy of notice, as they differ from fibromata of the same dimensions in several particulars that are useful in establishing a differential diagnosis. Thus, of the five specimens of adenoid spindle-celled growths which I have extirpated, all were lobulated, firm, elastic, adherent to the gland, grayish-white in color, and tough on section. The fibromata, on the other hand, were hard, merely nodular, less adherent to the mamma, white, and more compact and tough on section. Under the microscope the glandular elements were undergoing obliteration to a greater extent in the former than in the latter.

Inflammation and suppuration of mammary sarcoma are infrequent, but ulceration of the overlying tissues is so common that it occurred in 29, or 18.59 per cent., of the 156 cases that I have collated, a proportion which is nearly quadruple that met with in fibroma. As is witnessed in the latter tumor, the ulceration appears to be the result rather of inflammation and gangrene, or merely rupture, of the attenuated skin, than of its infiltration by sarcomatous cells; but in one case it depended upon exploratory puncture. In some examples it is doubtless due to invasion of the skin, but only one case, that of a crater-like ulcer, appears to have originated in this way. In 10 per cent. of the cases the ulcer presents itself in the form of a sloughing patch. Fungous protrusion almost invariably follows the perforation of the integuments, although in a remarkable instance recorded by Ashhurst,[1] the recurrent growth of which I exhibited at the Pathological Society, the ulcer subsequently healed. The protruding mass, which is usually an intracystic growth, as in Fig. 34, from Banks, varies in size from a hazelnut to three, four, and even five inches in diameter, and exhales a sanguinolent and fetid discharge, which may become more or less purulent. It is not, however, very prone to free hemorrhage or sloughing.

[1] *Trans. Path. Soc. Philada.*, vol. v. p. 230.

The ulcer itself is usually circular, and the surrounding skin is not only, as a rule, free from discoloration, but it is also unattached to the fungus, and everted, or rather elevated, on its sides. Now and then there are several ulcers, separated by bridges of sound tissue. From a diagnostic standpoint, it is worthy of notice that ulceration occurred in 7.69 per

FIG. 34.



Fungating Cystic Adenoid Sarcoma.

cent. of solid sarcomata against 18.76 per cent. of cystic sarcomata, and that it was met with in 25 per cent. of the giant-celled, 23.58 per cent. of the round-celled, and 17.58 per cent. of the spindle-celled tumors.

The metamorphoses and combinations of sarcomata are the myxomatous, fatty, telangiectatic, cystoid, calcareous, cartilaginous, and osseous. They usually begin in their centre, which may be quite soft and broken down, while the periphery is unchanged. Myxomatous degeneration is met with in 12.80 per cent. of all cases, being almost peculiar to the spindle-celled and cystic, and, along with fatty changes, is the most frequent cause of the large interstitial hemorrhages to which these tumors are liable. Although sarcomata are more vascular than the other neoplasms of the breast, they are only excessively so in 7.69 per cent. of all cases, in which event they are liable to be converted, in great part, into a dark-red, grumous, pultaceous material; and the dilated ducts often contain sanguinolent fluid, or even pure blood. In such cases minute examination discloses very numerous vessels, the adventitia of which is infiltrated with round cells undergoing fatty

degeneration, through which they lose their power of resistance, become varicose and dilated, finally give way, and emit a large quantity of their contents. Cystoid changes, due either to fatty or mucoid transformation of the glandular epithelium or to fatty changes of the sarcomatous cells, are met with in about 7 per cent. of all instances, the former being the more common and almost peculiar to solid sarcomata. These glandular and softening cysts must not, however, be confounded with the cysts which arise from ectasia of the ducts, and which constitute true cystic sarcoma. The contents of the false cysts may be yellowish, blood-stained, lactescent, mucoid, or gelatinous, and contain cholesterin. The cavities are rarely of large dimensions, although they may give rise to extensive areas of diffluent, broken-down tissue, and may be associated with extravasations of blood. Calcification is less common than in fibroma, as it was noticed in only four instances, or in 2.56 per cent. of all cases, in one of which cretaceous plates were found in the walls of a duct cyst, while in the others the mineral salts were interspersed throughout limited portions of the tumor. In three cases the growth was spindle-celled, and in one round-celled, and three were cystic. Chondrification is so rare that the only recorded cases are those of Bowlby,[1] cartilage cells being present in a cystic proliferous round-celled tumor, and of Coats,[2] who delineates a chondromatous fibrous sarcoma. Ossification has been described in four examples, or 2.56 per cent. of all cases. In that of Durham[3] the cystic tumor contained a plate of bony tissue, which consisted of close trabeculæ of comparatively well-developed osseous tissue. The three cases of Stilling[4] were also made up of true osseous trabeculæ, in the meshes of which spindle-cells, with a few giant cells, predominated in two, and round cells, with hyaline cartilage cells, in the third. In addition to these cases, Billroth[5] refers to a myxomatous sarcoma which contained small masses of true bone, but the case is devoid of history.

Sarcomata of the breast are generally solitary, since I find of 156 cases that only 10 were multiple, several growths existing in one gland in 7 and in both glands in 2, while in the tenth instance four tumors were present in one breast, and one tumor was found in its fellow. Their most common seat is in the vicinity of the nipple, and when they arise from the circumference of the organ they are usually found at its upper and outer quadrant. When of central origin they are, for the most part, cystic, while they are usually solid when they start from outlying lobules. In either event they evince a marked disposition to extend beyond the limits of their capsules, those of central origin gradu-

[1] *Trans. Path. Soc. Lond.*, vol. xxxiii. p. 306.
[2] *A Manual of Pathology*, Amer. ed., 1883, p. 707.
[3] *Trans. Path. Soc. Lond.*, vol. xxxv. p. 378.
[4] *Deutsche Zeitschrift für Chirurgie*, Bd. xv. pp. 247–253.
[5] *Op. cit.*, p. 48.

ally invading the entire gland and the surrounding soft parts, while the peripheral ones not only infect the latter structures, but also finally implicate the entire breast. As a rule, they give rise to broadly-based hemispherical tumors, but they are now and then pedunculated.

They occur as early as the ninth and as late as the seventy-fifth year, the average age of their first observation being 40.6 years. Of 148 cases in which the age is recorded—

1	appeared	at	9	years.		39	appeared	between	40	and	49 years.
14	"	between	10	and	19 years.	23	"	"	50	"	59 "
16	"	"	20	"	29 "	14	"	"	60	"	69 "
40	"	"	30	"	39 "	1	"	at	75	years.	

Of the entire number, only 4, or 2.70 per cent., occurred before the sixteenth year, or during the developmental state of the mamma; 67, or 45.27 per cent., appeared between the sixteenth and fortieth years, or at a period when the breast and genitalia are functionally most active; and 77, or 52.02 per cent., after the fortieth year, or during the period of their functional decline. Spindle-celled tumors develop earlier in life than the giant-celled and round-celled, since the average age at which they were noticed was thirty-six years and seven months, against forty-seven years and three months for the giant-celled and forty-eight years for the round-celled. Unlike cystic and solid fibromata, cystic sarcomata appear at an earlier age than solid sarcomata, the average for the cystic being thirty-eight years and five months, against forty-three years for the solid variety. Hence it may be said that spindle-celled and cystic sarcomata are metaplasias of the functionally perfect mamma, and round-celled, giant-celled, and solid sarcomata are metaplasias of the declining gland. In point of fact, the fifteen sarcomata occurring before the age of twenty were spindle-celled in fourteen.

Of the patients, 33 were single and 57 were married when the tumor was first noticed, while the social condition is not noted in the remainder. Of the married women, 40 were multiparous, 6 had one child, and 8 were barren, while the question of children is not stated in 3. In 2 cases the disease showed itself during pregnancy, and in 4 soon after parturition. Of 38 subjects in which the menstrual function is recorded, all were regular save 1, who suffered from amenorrhœa. In 17 instances, or one in every nine and one-third, injury was assigned as the cause of the tumor; in 1 it developed at the site of an abscess; in 1 it was preceded by psoriasis of the nipple; while in none was it inherited. These facts show that the etiology of sarcomata is most obscure, since their development is rarely traceable to injury or disease, and is not influenced by hereditary predisposition, while the social state and menstrual irregularities or arrest are surely unimportant agents in their production.

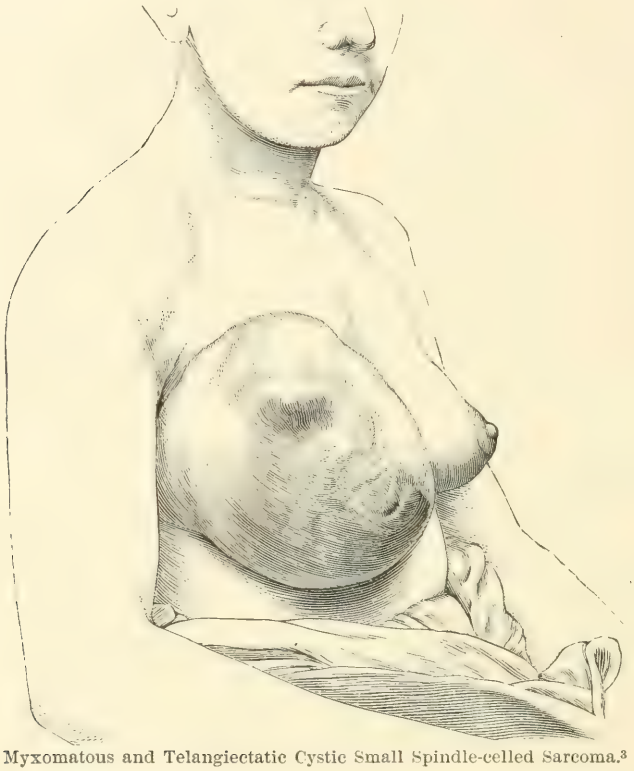
The increase of sarcomata is more rapid than that of the other connective tissue neoplasms, but it is liable to great diversity, being independent of the age of the subject, and influenced by their structure, by their degenerations, and by the absence or presence of cysts. Of the solid sarcomata, I have met with six examples which varied from one to two inches in diameter in five, six, seven, and eight months; and even at the end of two or three years they may not be larger than an apricot[1] or a turkey's egg,[2] although they may, in their pure state, attain the volume of an adult head in four months,[3] or a circumference of twenty-five inches and a weight of four pounds and two-thirds in nine months.[4] When they are the seat of myxomatous degeneration or of softening cysts, they may weigh four pounds and twelve ounces,[5] or measure twenty-three inches in circumference and weigh six pounds in four months.[6] Of the cystic, as of the solid, variety I have seen examples in which it did not exceed a diameter of two inches in five and eight months, while it is rarely larger than a fist in one year. In exceptional instances, however, it may attain the volume of a double fist in three months,[7] or a weight of upward of ten pounds in the same number of months,[8] or a circumference of thirty-one inches and a weight of twelve pounds in one year.[9] As an evidence of its unequal rate of progress we may state that it may require eighteen months,[10] five years,[11] eighteen years,[12] or forty years[13] to reach the volume of a fœtal head, or six years[14] or fifteen years[15] to attain the size of an adult head.

Like the cystic fibromata, sarcomata may remain stationary and of small dimensions for a long time, when, without obvious cause, they suddenly begin to increase, so that a nodule that has required fifteen years to attain the volume of a walnut reaches that of a double fist in three months;[16] or one which has remained the size of an egg for eighteen years acquires the volume of an adult head in a few months;[17] or one that has been quiescent and of the size of a walnut for twenty-five years suddenly begins to grow, and measures eighteen inches trans-

[1] Reverdin: *Bull. de la Soc. Anat.*, t. xlii. p. 708, and t. xliv. p. 285.
[2] Zambianchi: *Ibid.*, t. xlvi. p. 314.
[3] Billroth: *Chir. Klinik*, Wien, 1869-70, p. 142.
[4] Bryant: *Trans. Path. Soc. London*, vol. xix. p. 387.
[5] Bennett: *Cancerous and Cancroid Growths*, pp. 12 and 256.
[6] Hewson: *Gross' System of Surgery*, 6th ed., vol. ii. p. 974.
[7] Post: *Medical Record*, 1872, p. 112.
[8] Glück: *Langenbeck's Archiv*, Bd. viii. Jahresbericht, p. 599.
[9] Pitha: *Ibid.*, p. 599.
[10] Hubert: *Bull. de la Soc. Anat.*, t. xlviii. p. 690.
[11] Reverdin: *Ibid.*, t. xliv. p. 281.
[12] Pick: *Trans. Path. Soc. London*, vol. xx. p. 347.
[13] A personal case.
[14] Hubert: *Bull. de la Soc. Anat.*, t. xlvii. p. 389.
[15] Berbèze: *Ibid.*, t. xli. p. 94.
[16] Marignac: *Ibid.*, t. lii. p. 428.
[17] Tillaux, quoted by Cordier: *Thèse de Paris*, 1880, No. 494, p. 16.

versely by fourteen inches and a half vertically in three years;[1] or one that has been a year and a half in acquiring the volume of an egg grows to a circumference of twenty-six inches and a weight of seven pounds in an additional six months.[2] In such cases rapid accumulation of fluid and solid contents in the dilated ducts may be looked for; or the increase

FIG. 35.



Myxomatous and Telangiectatic Cystic Small Spindle-celled Sarcoma.[3]

in volume may be due to myxomatous changes and interstitial hemorrhage, as in the case from which Fig. 35 was taken. Under similar

[1] Anderson: *Trans. Path. Soc. London*, vol. xxiii. p. 254.

[2] Marchand: *Gaz. des Hôpitaux*, 1869, No. 51, p. 196.

[3] Myxomatous, telangiectatic cystic spindle-celled sarcoma, removed from a young and single lady, twenty-four years of age, who first noticed, seven years previously, or a few months after the establishment of menstruation, a lump as large as a hickory-nut just above and to the outside of the right nipple, which slowly increased until, at the end of six years, it was of the volume of the fist. It then began to grow rapidly, and measured, at the time of operation, twenty inches in circumference, or twelve inches and a half transversely and vertically, against seven and five inches for the opposite breast. The subcutaneous veins were only slightly enlarged; the nipple was buried in a crescentic fold; the skin was everywhere mobile and of normal tint, except above, over a large boss, where for two square inches it was adherent, attenuated, of a bluish tint, and pervaded by minute vessels; the outline of the breast was smooth and

circumstances their progress may be interrupted, of which I recently met with a notable example. On the 11th of November, 1886, I removed a proliferous cystic small spindle-celled tumor from a lady of sixty-five. At the age of twenty-five she accidentally observed a tumor as large as a chestnut at the inner side of the right nipple. It remained of that size until the age of sixty-one, when it began to grow, and during the past year had doubled its volume, so that it was larger than a fœtal head, and the breast measured seven inches more in circumference than its fellow. Its gross features are shown in Fig. 17. Robin[1] has recorded a case in which a vegetating myxomatous spindle-celled tumor remained of the size of a hazelnut for six years, when it grew continuously for four years and reached the volume of a fist, and then doubled its size in three years and a half, and during the last six months, or fourteen years from its first appearance, attained a weight of nine pounds. Tillaux[2] extirpated a cystic tumor which grew from the size of a filbert to a hen's egg in three years, at which size it remained stationary for four years, when in six months it acquired the volume of an adult head. Although these seven cases were examples of cystic tumors, their peculiar histories countenance the view held by Billroth,[3] Labbé and Coyne,[4] König,[5] Duplay,[6] and myself, that fibroma is frequently metamorphosed into sarcoma through multiplication of its cells and increased vascularization. The opponents of this view of a change of type may urge that a sarcoma may remain latent for many years, when, without obvious cause, it begins to grow rapidly; but there is certainly no reason why a fibrous tumor should not serve as the mother tissue of a sarcoma as well as ordinary fibrous tissue. Be

regular, except above, where it was bossed; the gland was freely mobile on the chest; the temperature was five degrees higher than that of the opposite breast; and the axillary glands were not involved. Throughout its entire course the tumor was absolutely painless. The patient's menses were regular; there was no history of trauma or heredity; but both nipples had been the seat of psoriasis ever since she could remember, and she frequently picked off the crusts.

After removal by S. D. Gross in May, 1879, the breast weighed nearly three pounds. On section there was an escape of a bloody fluid, and the cut surfaces were of a dark red color, and interspersed here and there with dilated ducts, a few of which contained delicate vegetations. Above, and corresponding with the altered integument, there was a large softening cyst, occupied by fluid blood. Below the remains of the gland were seen to be flattened and spread out. The neoplasm itself was surrounded by a capsule. The disease recurred in three months, and was removed six weeks later, but was again reproduced before the wound healed. At the expiration of six months after the extirpation of the breast death occurred from exhaustion, but a post-mortem examination was refused.

[1] *Journal de l'Anat. et de Phys.*, t. x. p. 195, and *Bull. de la Soc. Anat.*, t. xlviii. p. 817

[2] Cordier: *Thèse de Paris*, 1880, No. 494, p. 7.

[3] *Chir. Klinik*, Wien, 1871–76, p. 261.

[4] *Traité des Tumeurs Bénignes du Sein*, pp. 269, 283, and 363.

[5] *Lehrbuch der Spec. Chirurgie*, 4th Aufl., Bd. xi. p. 89.

[6] *Traité élément. de Path. Ext.*, par Follin et Duplay, t. v. p. 628.

this as it may, a long period of quiescence and an intermission of growth are not infrequent in sarcoma, and are of diagnostic value when compared with the progress of other neoplasms of the breast. As occurs in fibroma, continuous growth rather indicates freedom from cysts and vegetations, while sudden and rapid increase points to fluid accumulation and intracanalicular vegetations.

The growth of sarcomata might naturally be expected to be connected with menstruation, pregnancy, or lactation, or with conditions which render the mammary gland more vascular; but the influence of an increased flow of blood to the organ, which has been assumed by certain authors, is not confirmed by an analysis of the cases that I have collected. Thus, in only three examples was an increase in bulk witnessed at the menstrual period, while in two the tumor became smaller. In one the rapid growth began during pregnancy, and in two at the menopause.

From these considerations it follows that, while sarcomata constitute the most bulky of the mammary neoplasms,[1] their growth is so capricious that an average rate of increase cannot be assigned to them. On the whole, however, one is justified in concluding that the small-celled, the cystic, the myxomatous, and the telangiectatic increase more rapidly than the large-celled, the solid, and the pure tumors.

The active growth of the sarcomata is liable to be attended with marked elevation of the temperature, as was noted in two of my own cases, in one of which Seguin's surface thermometer indicated 100° against 95° for the opposite breast. In two other examples of cystic sarcoma there was an increase in the heat, as roughly estimated by the hand. All of these tumors were highly vascular and composed of small cells, so that elevation of the temperature may be said to be characteristic of telangiectatic and rapidly-proliferating growths. Further investigations in this direction may prove useful in determining the differential diagnosis of the connective tissue neoplasms, and should not be neglected.

During their further progress sarcomata continue, as a rule, mobile and free from superficial or deep attachments; the contiguous structures are not invaded by tumor elements; the skin remains natural in color and texture; the subcutaneous veins are not enlarged; the nipple is normal; and the associated lymphatic glands are not contaminated. To these general statements some exceptions must be noted:

a. While it is not uncommon for recurrent tumors to be more or less

[1] In his inaugural dissertation, *Ueber Fibro-Adenom der Mamma*, Göttingen, 1878, p. 13, Watson narrates a case from the practice of Kremer, in which the tumor weighed twenty-two pounds. Péan, in his *Leçons de Clinique chir.*, t. ii. p. 90, describes a myxomatous cystic spindle-celled sarcoma which weighed ten kilos, or more than twenty-six pounds; and a similar weight is recorded by Cordier in his *Thèse de Paris*, No. 494, 1880, p. 40, from the practice of Tillaux.

closely fixed to the pectoral muscle, and through it to the walls of the chest, it is a singular fact that the primary growth is, almost without exception, freely movable, and rarely attached even to the common integument. In a case of spindle-celled tumor recorded by Zambianchi—and it was an example of two growths in the same breast—the outlying tumor developed over the upper costal cartilages, to which it adhered, and sent a prolongation into the thorax.[1] In 6 additional instances, the muscles of the chest were involved in 5 and the paramammary fat in 1. The tumor was cystoid spindle-celled in 1, cystic spindle-celled in 2, round-celled in 1, osteoid round-celled in 1, and cystic giant-celled in 1. Just how often the skin is invaded is difficult of solution, since in some of the cases of ulceration it was doubtless converted into sarcomatous tissue, but microscopic data of this fact are wanting. Be this as it may, the skin was adherent in 15 examples, of which 10 were cystic and 5 solid tumors, the round-celled slightly predominating. If, in addition to the cases of invasion of the muscles, perichondrium, and connective tissue, these 15 cases be regarded as instances of invasion by tumor elements, sarcomata of the breast are to be regarded as locally infectious in 14.19 per cent. of all cases.

β. Although the skin may be stretched and attenuated and ulcerated, as already pointed out in 18.59 per cent. of all examples, it was discolored in only 36, or in 23 per cent.; and it is interesting to know that the changes in tint occurred 27 times in the cystic and 9 times in solid growths, 3 of which were the seat of degeneration cysts, and that the round-celled tumors predominated. In 21 the tint was red, in 4 bluish, in 10 violaceous, and in 1 livid.

γ. The superficial veins were enlarged in 24 instances, or in 15.39 per cent., but only to a slight extent in 2. In 18 the tumor was cystic, and in 6 it was solid, but in the latter it was the seat of extravasation of blood in one, and of mucoid cysts in the second. The spindle-celled growths predominated.

δ. The nipple was retracted or umbilicated in only 5, and these were examples of cystic growths.

ε. Of the 156 cases the lymphatic glands were enlarged, and now and then tender, in 19. In 14 of these the enlargement was associated with the primary growth, but in only 1, a case of alveolar pigmented round-celled sarcoma, were tumor elements detected.[2] In the remaining 5 the glands were extirpated along with recurrent growths, and in 2 of these—one an example of round-celled sarcoma communicated to me by Dr.

[1] Ante. Lagrange and Duret (*Bull. de Soc. Anat.*, t. xlviii. p. 516) refer to a case in which, on post-mortem examination of a female who had for many years an enormous sarcoma of the breast, the tumor separated the fibres of the pectoral muscles, passed between two ribs into the cavity of the mediastinum, and penetrated between and compressed the lobes of the lung, without infecting any of these structures.

[2] Billroth: *op. cit.*, p. 56.

Markoe of New York, and the second a case of alveolar giant-celled tumor[1]—were they infected. Hence the glandular enlargement was due to irritative hyperplasia in 16, in 10 of which ulceration of the tumor was present, while they were infected in only 3. This immunity of the glands from contamination is remarkable, and is a valuable sign in the differential diagnosis of malignant mammary growths.

A discharge from the nipple is not met with in the solid tumors, but occurs in one case out of every nine and a half of cystic sarcomata, the proportion being smaller than is met with in cystic fibromata, and is of great value as a symptom of enlargement of the ducts, although it is of itself unimportant in the differential diagnosis. In two instances from the practice of Bryant[2] the discharge was the first symptom, and preceded the detection of the tumor by three months in one and by two years in the other case. In a third case recorded by that surgeon[3] the flow was bloody and derived from highly vascular vegetations. In the case of Hubert[4] the tumor augmented in size at each menstrual period, when there was an occasional discharge of a citron-colored liquid. In the examples of Billroth[5] and Winslow,[6] in which the neoplasm developed during pregnancy, there was also a spontaneous escape of a serous fluid; while in those of Lebert[7] and Verneuil[8] a viscid transparent liquid was expelled by pressure.

The growth of sarcomata is attended with pain in 35.71 per cent. of all cases. In only 2.67 per cent., however, was attention first called to the tumor by suffering, and in the remainder it declared itself later, and varied in character and frequency in accordance with the variety of the sarcoma. Thus, in the solid form it was experienced in only 28 per cent. of the cases, and of these it was lancinating and continuous in 42.85 per cent., of an occasional darting character in 28.57 per cent., and lancinating and continuous only during the rapid increase of the tumor. In the cystic variety, on the other hand, it was felt in 41.93 per cent. of the cases, and in 69.23 per cent. of these it was, as a rule, severe and lancinating, and came on late in the disease, especially during rapid growth, when the tumor became tense through the increase of the contents of the cysts; while it was continuous and lancinating in 11.53 per cent., and slight in 19.23 per cent. In 14.28 per cent. of all cases it was only experienced when ulceration had set in, but ulceration and fungous protrusion provoked suffering in only 35.72 per cent. of all instances, and rarely increased it when it was previously felt. In one instance it was experienced only at the menstrual periods, while in

[1] Billroth: *op. cit.*, p. 58.

[2] *Guy's Hospital Reports*, ser. 3, vol. x. p. 115, and ser. 3, vol. xxviii. p. 468.

[3] *Ibid.*, vol. x. p. 120.

[4] *Bull. de la Soc. Anat.*, t. xlviii. p. 389.

[5] *Chir. Klinik*, Wien, 1869 and 1870, p. 142.

[6] *Maryland Med. Journ.*, vol. xii. p. 243.

[7] *Physiologie pathologique*, t. ii. p. 128.

[8] Valude: *Thèse de Paris*, 1885, No. 91, p. 131.

three it was aggravated, and in one diminished, at that period. In only five cases was the growth absolutely tender, although in many examples it was annoying from its weight and bulk, so much so, indeed, in a case recorded by Pick, that the woman repeatedly tapped the cyst with a penknife to rid herself of these features.

During their further progress, as we have already seen, sarcomata may invade their limiting capsules and the neighboring tissues, and finally ulcerate. Without, however, of necessity pursuing this course, their capsules may remain intact, but none the less may the tumor elements extend to the adjacent structures along the course of the blood-vessels, the adventitia of which is frequently the seat of small-celled proliferation, through which the tissues are converted into "latent zones of infection." These zones are not appreciable by the naked eye, but serve not only as the points of departure of the recurrences that are so often witnessed after their removal, but also as foci of general infection, with the production of deposits in the internal organs. Hence it is that the prognosis of sarcomata is eminently unfavorable, although there is still no little diversity of opinion among practical surgeons and pathologists on this point. Thus, Wilks and Moxon,[1] Cornil and Ranvier,[2] Labbé and Coyne,[3] and Erichsen[4] regard them, and particularly the cystic form, as being comparatively innocent, and only marked by a tendency to local reproduction. Labbé and Coyne and Erichsen deny the possibility of the general dissemination of spindle-celled tumors; and Erichsen, indeed, advances the doctrine that "the tendency to recurrence will, in most cases, gradually wear itself out, and after several operations have been required at intervals of months or a year or two the disease will cease to be reproduced, and a cure will be thus established;" although he adds that "instances are not wanting in which the tendency to the local reproduction of the sarcoma has been so active that it outran all possibility of complete extirpation, and eventually destroyed the patient." Virchow[5] states that while sarcoma may recur in loco, "it is a tumor of limited malignity, but fully capable of producing metastases;" and Lücke[6] endorses this view. Birkett,[7] Gross,[8] Ashhurst,[9] Klebs,[10] Billroth,[11] Annandale,[12] Winckel,[13] and Agnew,[14] on the other hand, fully recognize the malignant attributes of sarcomata as denoted by their

[1] *Lectures on Path. Anatomy*, p. 584, 1875.
[2] *Op. cit.*, p. 1162.
[3] *Op. cit.*, p. 431.
[4] *Science and Art of Surgery*, 8th Am. ed., vol. ii. p. 710.
[5] *Op. cit.*, p. 362.
[6] *Pitha and Billroth's Hdbch. der Allg. und Spec. Chir.*, Bd. ii. Abth. i. p. 194.
[7] *A System of Surgery*, edited by Holmes and Hulke, 3d ed., vol. iii. p. 451.
[8] *System of Surgery*, 6th ed., vol. ii. p. 973.
[9] *Philada. Med. Times*, vol. ix. p. 384, 1879.
[10] *Op. cit.*, p. 1118.
[11] *Op. cit.*, p. 60.
[12] *Internat. Encyclop. of Surgery*, vol. v. p. 842.
[13] *Lehrbuch der Frauenkrankheiten*, p. 754.
[14] *Princ. and Pract. Surgery*, vol. iii. p. 702.

capability of reproducing themselves, not only in the neighboring tissues, but also in remote parts; and other writers regard their progress as being "much more favorable" than that of mammary carcinoma.

The greatest obscurity exists in regard to the cystic sarcomata, which include the tumors in which the dilated ducts are more or less closely filled with vegetations. This uncertainty is due to the fact that many English and German pathologists and surgeons class cystic adenomata, cystic fibromata, and cystic myxomata under the term cystic sarcoma. Marcus Beck,[1] the latest writer on the subject, indeed, denies the presence of duct cysts in sarcoma.

In 1880, I certainly established the fact that all the varieties of sarcoma of the breast are malignant; and a careful study of 92 of the 156 cases upon which this account is based, and in which the final reports extend beyond the mere statement of the recovery or death of the patient, confirms this view.

Of the 92 cases, only 1 ran a natural course, it being an example of round-celled tumor of both breasts that proved fatal, with presumed secondary deposits, in seven months from the first appearance of the disease. The remaining 91 were subjected to the knife. Of these, 32 were well for periods which varied between one month and ten years and nine months; 42 were marked by local recurrence; in 8 not only was there regional reproduction, but metastases were found post-mortem; 3 recurred, with unmistakable evidences of general dissemination; 4 were characterized by metastases, and 2 by presumed metastases, without recurrence. In other words, 64.83 per cent. of these cases were endowed with malignant features. Let us examine these general statements more in detail: 32 patients were alive and well for an average period of forty-nine months and ten days after operation, the disease having existed, on an average, for sixty-nine months and eleven days before surgical interference, so that the mean life of these subjects was nearly ten years. The period of freedom from recurrence was—

From	1	to	12	months	in	4	cases.[2]	For	7 years	and	3 months in 1 case.
"	1	"	2	years	"	4	"	"	8	"	" 1 "
"	2	"	3	"	"	7	"	"	9	"	" 11 " " 1 "
"	$3\frac{1}{2}$	"	4	"	"	5	"	"	10	"	" 1 "
"	4	"	5	"	"	5	"	"	10	"	" 4 " " 1 "
								"	10	"	" 5 " " 1 "
								"	10	"	" 9 " " 1 "

As has been seen, there was local reproduction in 53 cases. In 45, in which the date is noted, the periods of recurrence were as follows:

[1] *Dictionary of Practical Surgery*, edited by Heath, p. 183.

[2] The shortest periods were 1 month, 4, 6, and 10 months.

2 cases in 3 weeks.	3 cases in 12 months.
2 " " 1 month.	1 case " 15 "
7 " " 2 months.	1 " " 17 "
3 " " 3 "	2 cases " 18 "
2 " " $3\frac{1}{2}$ "	1 case " 20 "
2 " " 4 "	1 " " 21 "
5 " " 5 "	3 cases " 24 "
3 " " 6 "	1 case " 29 "
1 case " 7 "	1 " " 32 "
1 " " 8 "	1 " " 36 "
1 " " 9 "	1 " " 48 "

The table shows that more than one-half, or 57.7 per cent., of the reproductions took place in six months, while after twelve months there were only 13, or 28.8 per cent., and of these there were only 4, or 8.8 per cent., after two years. These statements lead to the belief that the chances for the patient are relatively good after the lapse of two years, and that the prognosis is all the more favorable as the period of freedom from signs of local contamination prolongs itself. As the latest date of reproduction was four years, we may assume that the 12 cases of the first table which remained well after the lapse of that time were permanently cured. The average date of recurrence was ten and a half months, and the total life of these patients from the first observation of the disease to the final report after the last operation was seven years and nine months. The number of recurrences, or operations for recurrence, was 1 in 23 cases, 2 in 13 cases, 3 in 7 cases, 4 in 1 case, 5 in 4 cases, 6 in 2 cases, 7 in 1 case, 12 in 1 case, and 22 in 1 case.

While the average was ten and a half months, the histological constitution of the growth appears to have exerted a marked influence upon the date of recurrence. Thus, the mean date of local reproduction was four months and twenty days for the round-celled, eleven months and twenty-seven days for the spindle-celled, and twelve months and ten days for the giant-celled. The cystic tumors recurred in eight months and five days, and the solid in thirteen months and nine days; and this contrast becomes the more striking when we state that the average date of recurrence for cystic round-celled growths was three months and four days as against six months and eight days for the solid round-celled, and nine months for cystic spindle-celled as against sixteen months for the solid spindle-celled.

Of the 91 cases, metastatic growths, as demonstrated post-mortem or by unmistakable evidences during life, had formed in 17, or 18.68 per cent. There can be no doubt that this estimate is too low, since of 20 examinations of persons dead from the effects of the primary operation, or dead after secondary operations, metastatic growths were found in 12, or 60 per cent. The total duration of life from the first appearance of the primary tumor to the death of the 17 patients was fifty-

seven months, nine months having been the shortest, and twenty-five years and seven months the longest, period. The relative frequency of the seats of the secondary deposits is shown by the following statement:

Lungs	in 10 cases.	Pleura	in 1 case.
Liver	" 4 "	Heart	" 1 "
Brain	" 3 "	Kidney	" 1 "
Dura mater	" 1 case.	Muscles	" 1 "
Retroperitoneal glands	" 1 "	Bones	" 1 "
Mediastinum,	" 1 "		

The prognosis is materially influenced by the age of the patient and by the size and rate of increase of the tumor. Thus, before the age of thirty-five, when the mammary gland is functionally most active, a small, slowly-growing sarcoma does not return, while a rapidly-increasing tumor, especially the cystic variety, is very liable to recur. Among the latter class of cases, 60.71 per cent. were characterized by recurrence, and 10.71 per cent. by metastatic tumors. Of these, the solid sarcomata recurred in 53.84 per cent., and gave rise to secondary growths in 7.69 per cent., while the cystic recurred in 66.66 per cent., and were marked by metastases in 13.33 per cent. It does not appear, however, as many writers assert, that the more tender the age the more rapid is the growth of, and the more malignant is, the neoplasm. Thus, of 15 cases, the ages of which varied from nine to nineteen years, or sixteen and a half years on an average, the tumor had been in existence on an average for seven and a half years before its removal, and 28.57 per cent. remained well, while 71.43 per cent. recurred, and metastases were not observed in a single instance. After the thirty-fifth year, on the other hand—and the danger increases with advancing age—the greater is the liability to metastases, as in this class of cases 19.35 per cent. were generalized and 43.54 per cent. recurred. Of these, the solid tumors recurred in 47.05 per cent., and gave rise to secondary growths in 23.54 per cent., while the cystic recurred in 44 per cent., and were marked by metastases in 16 per cent. of all cases. In other words, a sarcoma occurring in a functionally active breast evinces a marked disposition to recur after operation, with less disposition to metastases, while a sarcoma of the declining breast recurs less frequently, but is generalized in a greater number of instances.

The prognosis is also influenced by the histological constitution and the stage of evolution of the tumor. Of the spindle-celled, 65.10 per cent. recur, and 20.40 per cent. give rise to metastatic growths; of the round-celled, 60 per cent. recur, and 25 per cent. are generalized; of the giant-celled, 57.14 per cent. recur, and in none are there metastases; of the solid, 64.58 per cent. recur, and 25 per cent. are dissemi-

nated; while of the cystic, 51.16 per cent. recur, and 11.62 per cent. are generalized. Hence, while the round-celled are the most malignant, the metastasis of the spindle-celled is by no means to be denied, nor can we say, with certain writers, that the cystic variety is an innocent tumor or one of limited malignity, since it recurs in more than one-half of all cases, and generalizes itself in about one case out of every nine. These investigations demonstrate that the usual statements, which are so opposed to the actual facts, as to the malignity of sarcomata, are due either to their not having been based upon a careful analysis of a sufficient number of recorded cases confirmed by minute examination, or to the confounding of cystic sarcomata with other cystic growths which never infect the economy.

While I have been unable to collate cases in which the disease ran a natural course, through which we are deprived of data bearing upon the duration of life in this class of patients, and comparing them with the average duration of life of those subjected to the knife, there can be no doubt that operations do result in permanent recoveries and prolong life, even if a final cure is not attained. From an inspection of the two tables on a previous page, it appears that recurrence may be delayed for four years, and that 12 subjects were alive and well after four years; so that if we take four years as the criterion of safety, the 91 operations show 13.18 per cent. of cures.

Although the recurrent regional disease is more intense than the primary, and other reproductions generally follow in quick succession, the removal of tumors as fast as they appear certainly alleviates suffering, prolongs life, averts visceral contamination, and occasionally brings about a cure. Thus, Bryant[1] removed the entire breast for a round-celled sarcoma on January 9, 1883, and up to February 10, 1886, performed twelve operations for multiple recurrent growths, the opposite breast being the seat of an atrophic scirrhus of sixteen years' standing. Billroth[2] enucleated a cystic sarcoma, and removed four recurrent growths in four years, the breast being extirpated at the last operation, and the woman was free from disease three years subsequently. Erichsen[3] extirpated the entire breast for a cystic growth of twenty-seven years' standing in 1859, and removed recurrent growths in 1861, 1863, 1864, 1865, and 1866, death ensuing from paralysis "some years after the last operation." In Heath's[4] case of removal of the gland for a spindle-celled tumor six operations for recurrences were done in thirteen years, and the patient was alive with a seventh recurrence. In that of Haward[5] a spindle-celled tumor was removed in

[1] Private communication, March 6, 1886.
[2] *Op. cit.*, p. 68.
[3] *The Science and Art of Surgery*, 8th Amer. ed., vol. ii. p. 711.
[4] *British Medical Journal*, 1878, vol. i. p. 194.
[5] *Trans. Clin. Soc. London*, vol. vii. p. 106.

1860, and recurrent growths were excised in 1863, 1869, and 1873. The patient died, without metastases, from the effects of the last operation, but life was prolonged, as in the preceding instance, for thirteen years. Riedel[1] removed six recurrences in twenty years following an operation for giant-celled sarcoma, and on death there were no metastases. Gay,[2] in May, 1865, enucleated from the same breast two cystic spindle-celled sarcomata of six years' standing. Recurrent growths were removed in July, 1867, with the entire gland, in May, 1869, and May, 1874, in June, 1878, in May, 1880, and in June, 1881, so that life was extended for fourteen years, and the woman was still living at the date of the last report. The case of S. D. Gross,[3] however, is, so far as I know, the most remarkable on record. In March, 1857, a single woman, aged forty-four, discovered a small tumor in the left breast, which, on enucleation the following October, proved to be a small spindle-celled sarcoma. During the next sixteen months two more partial operations were performed, and a fourth tumor, along with the entire breast, was extirpated in May, 1859. In three months and a half the knife was again required, and soon afterward other tumors were removed. In 1860 she underwent eleven operations, and six in 1861, the last of which was performed in September of that year, so that she was subjected to twenty-two operations for fifty-one recurrent tumors in four years. They varied in size from an almond to a hen's egg, appeared at or near the cicatrices in a few weeks, and rapidly assumed a fungating aspect. Large portions of the pectoral and also of the external and internal intercostal muscles were cut away, so that during a deep inspiration there was a slight protrusion of the pleura. Ten years and nine months after the last operation she was in perfect health. In these eight cases there was no lymphatic involvement and the general health was unimpaired.

A study of the preceding facts shows that, like carcinoma, sarcoma is a malignant growth. It differs, however, from the former in many important features, which are shown in the following statement:

	Sarcoma.	Carcinoma.
Invasion of the skin by tumor elements	9.67 per cent.	62.26 per cent.
Invasion of the chest-walls	3.87 " "	15.69 " "
Invasion of the paramammary connective tissue	0.64 " "	12.70 " "
Primary invasion of the axillary glands	0.64 " "	68.07 " "
Local reproduction after removal	58.24 " "	66.80 " "
Metastases found post-mortem	60.00 " "	51.00 " "
Average duration of life	81 months.	38.5 months.
Permanent cures	13.18 per cent.	11.83 per cent.

[1] *Centralblatt für Chirurgie*, 1881, Bd. viii. p. 636.

[2] *Trans. Path. Soc. London*, vol. xvi. p. 240; vol. xx. p. 359; vol. xxv. p. 233; vol. xxxi. p. 272; and vol. xxxiii., Suppl., p. 24.

[3] *A System of Surgery*, 6th ed., vol. ii. p. 964.

From this table it appears that sarcoma is less infectious locally, but more infectious as regards the general system, than carcinoma. Its more relatively benign character is shown not only by the larger proportion of cures, but also by the fact that the average duration of life, from the first observation of the disease to the date of the last removal after operation, is forty-two months longer; and this contrast becomes the more striking when it is stated that the majority of the sarcomatous patients were still living, and the majority of the carcinomatous subjects were dead. Not only is this statement true for sarcomata in general, but it holds good for the three varieties, since the average life for round-celled sarcoma is fifty-four months, ninety months for the spindle-celled, and one hundred and eight months for the giant-celled.

The diagnosis of small, slowly-increasing fibrous sarcomata is by no means easy, as they are very liable to be confounded with fibromata, particularly when they arise at the circumference of the mamma. A tumor, however, of soft, apparently fluctuating consistence, with elevated temperature, conveying the impression of an abscess, and occurring in young women, which attains a large volume in a few months, can scarcely be anything else than a medullary sarcoma. On the whole, the diagnosis is based upon their indolent origin, mobility, elastic or unequal consistence, lobulated outline, rapid increase, freedom from lymphatic involvement, their tendency to ulcerate, the not infrequent discoloration of the skin and enlargement of the subcutaneous veins, and possibly elevation of temperature; upon the suffering which they awaken late in the disease; and upon their greatest frequency after the fortieth year.

The only tumors met with before the age of sixteen are fibromata and sarcomata, the former being more than twice as common as the latter. The fibromata are always solid, and grow slowly, while the sarcomata are cystic in three-fourths of all instances, and medullary in the remaining fourth, and, as a rule, grow rapidly. Hence cystic and medullary tumors at this period of life are sarcomata and nothing else.

Between the spindle-celled, round-celled, and giant-celled there are some marked similarities which render their differentiation difficult. The spindle-celled, however, are characterized by their development at a comparatively early age, by the attendant suffering, by the enlargement of the subcutaneous veins, by their slow reproduction after removal, and by their long life. The round-celled, on the other hand, appear, as a rule, at a comparatively late age, and are painless; but the skin is liable to be discolored and ulcerated, and recurrence is rapid and the duration of life is relatively short. The giant-celled likewise appear late in life, but are painful; discoloration of the skin and ulceration are also common; but there is no enlargement of the veins, while irrita-

tive enlargement of the axillary glands is frequent. Local reproduction is delayed longer than in the other varieties, and the duration of life is remarkable.

These points are set forth in the following table, in which the affinities and contrasts of the three principal varieties may be seen at a glance:

	Spindle-celled.	Round-celled.	Giant-celled.
Average age of appearance	36 years.	48 years.	47 years.
Appear before sixteenth year	12.08 per ct.	0.83 per ct.	0 per ct.
Pain	60.00 "	10.81 "	43 "
Skin discolored	20.88 "	32.35 "	25 "
Ulceration	17.58 "	23.58 "	25 "
Veins enlarged	17.58 "	11.76 "	0. "
Glands swollen	6.59 "	8.82 "	37.5 "
Glands infected	0. "	2.94 "	0. "
Adjacent tissues invaded	13.18 "	17.64 "	25 "
Local reproduction	65.10 "	60. "	57.14 "
" " average date of	12 months.	$4\frac{2}{3}$ months.	$12\frac{1}{3}$ months.
Metastatic deposits	20.40 per ct.	25 per ct.	0 per ct.
Average life with operation	90 months.	54 months.	108 months.

Between the solid and cystic varieties there are certain distinctions which are useful in establishing a differential diagnosis. The former develop at about the forty-third year; the skin is discolored in 11.53 per cent.; ulceration occurs in 7.69 per cent.; the veins are dilated in 7.69 per cent.; there is no discharge from the nipple, nor is it retracted; pain is met with in 28 per cent.; the surrounding tissues are invaded by tumor elements in 11.54 per cent.; the lymphatic glands are enlarged in 11.54 per cent., and infected in 1.28 per cent.; recurrence ensues in 64.58 per cent., and metastatic growths are met with in 25 per cent. of all instances. Cystic sarcoma starts, as a rule, at the thirty-eighth year, and is not, as is asserted by many writers, most common between twenty and thirty-five years, as just as many cases occur after as before the latter age; it grows more rapidly than the solid variety, and its increase is often sudden after having remained stationary or advanced slowly for some time. Now and then, after evacuation of the fluid of the superficial cysts, their solid contents can be detected by manipulation; their consistence is, as a rule, unequal, and they are more largely lobulated than the former variety. The skin is discolored in 34.61 per cent.; the tumor ulcerates in 18.76 per cent.; the veins are enlarged in 23.07 per cent.; the nipple is retracted in 6.41 per cent., and discharges fluid in 10.25 per cent.; pain is experienced in 41.93 per cent.; the adjacent tissues are infected in 16.66 per cent.; the lymphatic glands are swollen in 5.12 per cent., but they are never invaded by tumor elements; while the growth recurs in 51.16 per cent., and becomes generalized in 11.62 per cent. of all cases.

There are no signs by which cystic sarcomata can be absolutely dif-

ferentiated from cystic fibromata, with which they are so frequently confounded. The latter develop earlier in life, and a discharge from the nipple is more common than in the former; but ulceration and enlargement of the veins are only one-half as frequent, and they are not attended with glandular enlargement or malignant features. It should, however, be stated that the largest proliferous cystic tumors met with in old, married multiparæ are generally sarcomata.

As no attempt has hitherto been made to describe the life-history of the giant-celled variety and some of the modified forms of mammary sarcoma, the following facts will be found to be not devoid of interest: In 8 cases of giant-celled tumors that I have collated, the average date of their first observation was forty-seven and a quarter years, or at the ages, respectively, of forty-two, forty-five, forty-five, forty-six, forty-six, forty-nine, fifty, and fifty-five. Of the six cases in which the social condition is noted, 3 were married, of which 2 were parous, and 3 were single. The tumors were solid in 6, of which 1 was alveolar, and cystic in 2. The skin was violaceous in tint and adherent in 1 case of cystic tumor, and red and stretched in 1 of solid tumor. In one of the cystic tumors there was firm attachment to the great pectoral muscle. Ulceration was met with in 3, of which 2 were solid and 1 was cystic. The axillary glands were enlarged, but not infected, in 3 cases, 2 of which were cystic and 1 was solid; and enlarged lymphatic glands were detected in 3 cases of recurrence of solid tumors, in 1 of which, an alveolar growth, they were invaded by tumor elements.

All of the cases were subjected to the knife. In 1 the history ceases with the operation.[1] In 3 there was no recurrence, and the patients were alive subsequently for ten years and five months,[2] three months,[3] and ten years.[4] In 4 the tumor recurred. In Billroth's[5] case a reproduction, with infected glands, was removed in two months, and another similar operation was performed in a few months. The patient died of erysipelas, but metastases were not found post-mortem. In the case of Riedel[6] six recurrent growths were removed in twenty years, and on death it was found that the patient was free from metastases. In the case of Estlander[7] a recurrent growth, along with the glands of the axilla, was removed in two years and five months, and the patient was well five years and nine months subsequently; while in the case of Stanley[8] the patient died with a recurrent tumor in two years after the extirpation of the breast. The average total duration of life of these

[1] Estlander: *Rev. Mens. de Méd. et de Chir.*, 4, 1880, p. 795.
[2] *Ibid.*, p. 796.
[3] Lancereaux: *Bull. de la Soc. Anat.*, t. xxxv. p. 292.
[4] Paget: *Trans. Clin. Soc. London*, vol. vii. p. 108.
[5] *Op. cit.*, p. 58.
[6] *Centralblatt für Chirurgie*, 1881, No. 40, p. 636.
[7] *Ut supra.*
[8] Paget: *Lect. on Surg. Path.*, 3d ed., p. 555.

patients from the first observation of the disease to the final report was nine years.

It will thus be seen that giant-celled, or myeloid, sarcoma sets up irritative enlargement of the lymphatic glands in 37.5 per cent. of all cases; that the skin is discolored, the tumor ulcerated, and the surrounding tissues are infected in 25 per cent.; that the subcutaneous veins and nipple are normal; and that, while it recurs in 57.14 per cent., it never gives rise to metastatic growths.

Osteoid sarcoma, or the variety which contains true osseous tissue, has been met with at the ages of twenty-seven, forty-six, forty-nine, and fifty-one years, the average being forty-three years. It occurs usually in married multiparæ; as a rule grows slowly; is hard, except when it has undergone cystoid degeneration; acquires large dimensions in one-half of the cases; and is painful during its rapid growth. It ulcerates in one-fourth of all instances; invades the adjacent tissues in one-half; does not infect the lymphatic glands, nor is it marked by dilatation of the superficial veins.

The case recorded by Durham[1] is devoid of further history. Of the three reported by Stilling,[2] in which an operation was practised, one died in twenty-three months, without recurrence, but with evidences of metastatic growths in the lungs and pleuræ; one died of pneumonia on the third day, with secondary tumors of the lungs and sarcomatous thrombosis of the veins of the pectoral muscle, the disease having existed for eighteen months; and the third was characterized by two local reproductions and a metastatic growth of the left ventricle of the heart about sixteen weeks after the primary operation, the total life having been ten years and four months. The average life of these cases from the first observation of the disease until its termination was fifty-seven months, and the average life after operation was thirteen months and a half. Hence, metastases occurred, or were presumed to have occurred, in all the cases, and of those who survived the knife local reproduction was witnessed in one-third, and a recurrent growth would certainly have been formed if the patient with sarcomatous pectoral veins had survived. From these considerations osteoid sarcoma must be regarded as the most malignant of the mammary sarcomata.

The life-history of pigmented alveolar round-celled sarcoma can only be based upon two cases. In that of Billroth[3] a hard tumor, of three years' duration, as big as a child's head, and adherent to the skin, was removed, along with infected glands, from a multipara sixty-five years old. The patient died of exhaustion, without recurrence, in eight months, but there was no post-mortem examination. In the case of

[1] *Trans. Path. Soc. London*, vol. xxxv. p. 378.

[2] *Deutsche Zeitschrift für Chirurgie*, Bd. xv. pp. 247–253.

[3] *Op. cit.*, p. 56, Fig. 57.

Butlin[1] a tumor of seven years' standing was removed in 1880 from the otherwise normal breast of a woman of fifty-eight. Recurrent growths were extirpated in 1882, 1884, and 1886, but the history ceases with the last operation. In addition to these cases, Wacker[2] describes a case of multiple melanotic alveolar round-celled sarcoma of both breasts, with infection of the glands of the left axilla and metastatic tumors of the spleen, mesenteric glands, and brain. The disease was thought to be secondary to melanotic sarcoma of the skin of the mammæ. Winckel depicts a proliferous myxomatous melanotic sarcoma, but the case is devoid of history.[3]

The treatment may be summed up in a few words. Before the age of thirty-five a slowly-growing fibrous sarcoma does not return, so that simple enucleation from its capsule will suffice. In all of the other varieties, and especially in the soft tumors of young women, which attain a large volume in a few months, and in the rapidly-increasing tumors, including the cystic variety, after the thirty-fifth year the treatment must be thorough. In such cases, as has been pointed out, local recurrence after the ordinary method of extirpation may be looked for in nearly six-tenths of all operations. To guard against this, my firm conviction is that the entire breast, including its investments, should be amputated, the pectoral fascia dissected off, and the exposed muscle mopped with a strong solution of chloride of zinc or seared with the hot iron. As it is impossible to tell beforehand the exact nature of the tumor, the axilla should be opened and enlarged glands searched for and removed. These cases are desperate, and do not admit of half measures; and the end in view certainly justifies what at first sight appears to be a harsh practice. Should this advice not meet with approval, the very least that the surgeon should do is to extirpate the entire breast, along with any skin that may be invaded, especial care being paid to the complete removal of every particle of paramammary fat and the fascia of the pectoral muscle, in which tissues experience shows that recurrence takes place. In the event of repullulation the growths should be freely excised as fast as they appear, as such a practice not only prolongs life, but may bring about a final cure.

Myxoma.

Of the connective tissue neoplasms of the mammary gland, by far the most rare is that denominated myxoma by Virchow, which is synonymous with the collonema of Müller, the gelatinous sarcoma of Rokitansky, the net-celled sarcoma of Billroth, the soft and succulent form of fibrocellular tumor of Paget, and the colloid, mucous, or gelat-

[1] *Lancet*, January 8, 1887, p. 72.

[2] *Inaug. Dissert.*, Rostock, 1884, p. 15.

[3] *Lehrbuch der Frauenkrankheiten*, p. 756.

inous tumor of other pathologists. Rindfleisch briefly describes it as cystosarcoma mucosum, and Birkett refers to it as colloid growth, but the history of its life is lost in that of colloid carcinoma. I have myself never met with it, although I recently examined a specimen removed by my friend Dr. J. M. Barton, and, after careful research, I have been able to collect only fourteen examples, confirmed by minute inspection.

In structure, pure or hyaline myxoma has its physiological prototype in the soft rudimentary connective tissue and enamel organ of the fœtus, in the Whartonian jelly of the umbilical cord, and in the adult vitreous body. It consists, as is represented in Fig. 36, from Billroth, of a meshwork of vessels, the spaces between which are filled with a mucous substance beset with round and oval, but more especially with spindle and stellate, cells, from which numerous filamentous and anastomosing processes or prolongations are given off. Tumors thus constituted have a translucent, greenish, yellowish, or yellowish-gray color, are of soft, jelly-like consistence, and yield, on pressure or scraping, a clear, sticky, viscid, or filamentous fluid, similar to a solution of gum arabic, and exhibiting the chemical characters of mucin.

FIG. 36.

Hyaline Myxoma, showing the characteristic anastomosing stellate and spindle cells, as well as round cells, which are contained in the meshes of a vascular network. The nuclei in the walls of the vessels are very apparent. × 400.

From this simple type of structure there are certain deviations, through which are constituted the following varieties:

α. Medullary Myxoma.—When the cells—which, compared with the intercellular substance, are usually few in number—proliferate and preponderate either throughout the entire mass or at localized points, and the tissue has a whitish, opaque, or even an encephaloid, appearance, the term medullary is prefixed to the growth.

β. Lipomatous Myxoma.—When, on the other hand, without having necessarily multiplied, the cells are converted into fat cells, and the gelatinous material contains firmer areas of a yellow, yellowish-white, or brownish-white tint, the tumor is known as lipomatous myxoma.

γ. Fibrous Myxoma.—If the mucoid intercellular substance is pervaded by rather abundant ordinary connective tissue and elastic fibres

in the form of delicate bands or meshes, the neoplasm is converted into a fibrous myxoma, which has a grayish or whitish tint, is tolerably firm, and is not unlike œdematous areolar fibroma.

δ. Cystoid Myxoma.—If, as occasionally happens, the cells themselves undergo mucoid transformation and disintegrate, and the matrix liquefies, cystoid spaces filled with less consistent mucoid fluid result, and change the growth into a cystoid myxoma.

ε. *Telangiectatic Myxoma.*—Any of these varieties may become so vascular through the new formation of vessels as to constitute telangiectatic myxoma, or, in the event of the rupture of the delicate and enlarged vessels and interstitial bleeding, hemorrhagic myxoma. These occurrences are denoted by the rosaceous, red, dark-red, or brownish-red discoloration, and even by vessels which are visible to the naked eye.

Hyaline myxoma constitutes the most common variety. Of 9 examples in which the minute features are described, 2 were hyaline, 1 was hyaline and fibrous, and 1 was hyaline and hemorrhagic; 2 were lipomatous, and 2 telangiectatic and lipomatous; while 1 was fibrous and telangiectatic. Hence the hyaline, fatty, and vascular varieties constitute the majority.

Like the other histoid neoplasms, myxoma originates in the interlobular and intertubular connective tissue, which, from being dense and resisting, reverts to its rudimentary or mucous state. Just how often the adipose tissue of the gland serves as its starting-point it is, of course, impossible to say; but a case recorded by Moore, in which a portion of the tumor consisted of almost pure fat, appears to favor the idea that the primary growth was of that nature, and that the fat cells had returned to their embryonic condition.

The entire mamma may be converted into a bulky mass, or one or more lobules may alone be concerned in the tumor formation, thereby constituting diffused and lobular, or circumscribed, myxomata. The latter are the more frequent, as limited portions of the gland were affected in ten of the fourteen instances[1] which I have collated. In one of these, as occurs also in fibroma and sarcoma, the growth, which was as large as an orange, displaced the gland backward, but was attached to it by a pedicle of the thickness of two fingers. In the remainder the tumor was merely encapsuled, without being fixed to the mamma. In both forms the lacteal glands usually disappear; but in one-half of all examples the dilated ducts are filled with vegetations,

[1] The cases are recorded by De Morgan, *Trans. Path. Soc. London*, vol. xx. p. 360; Cooke, *ibid.*, vol. xix. p. 398; four by Péan, *De la Forcipressure*, p. 41, and *Leçons de Clinique chir.*, t. i. p. 478, and t. iii. p. 724; Labbé and Coyne, *op. cit.*, pp. 322 and 326; Moore, *Dublin Journ. of Med. Science*, vol. lxiii. p. 489; Virchow, *op. cit.*, p. 427; Cornil and Ranvier, *op. cit.*, p. 1162; Jüngst, *Virchow's Archiv*, Bd. xcv. p. 195; Parker, *Trans. Path. Soc. London*, vol. xxxii. p. 237; Terrillon, *Le Progrès médical*, March 6, 1886, p. 188; and Barton, personal communication.

and constitute the intracanalicular, papillary, or vegetating variety of myxoma.

Mucous tumors are solitary, round, or ovoid, occasionally nodular or lobulated, and are usually seated in the upper hemisphere of the breast and toward its outer periphery. They are quite liable to inflammation, ulceration, and fungous protrusion, as those accidents were met with in three of the twelve examples in which the histories are complete. In one of Péan's cases the tumor, which had existed for fourteen years in a woman aged fifty-five, had been the seat of a superficial abscess for six weeks. In one described by Labbé and Coyne the intracanalicular growth protruded through an opening in the skin in the form of a bleeding black mass, and was the seat of an occasional slight hemorrhage. In this instance the ulceration was due to specific infiltration of the skin, as the papillæ were much enlarged and composed of myxomatous tissue. In the case of telangiectatic lipomatous tumor recorded by Moore ulceration ensued in five years, and the patient nearly bled to death. During the last twelve months of its existence it bled at each menstrual period, and the hemorrhage was quite profuse, and it discharged gelatinous material for one month before its removal.

Myxomata develop as early as the twenty-ninth and as late as the fifty-sixth year, the average being forty-four years and a quarter. Of 12 cases in which the age is noted,

1	appeared	between	20	and	29	years.
2	"	"	30	"	39	"
6	"	"	40	"	49	"
3	"	"	50	"	59	"

Hence, as three-fourths of the entire number appear during the functional decline of the mamma, their evolution, like that of carcinoma, is intimately connected with the period of obsolescence of the breast, or when the glandular structure is disappearing and the fibrous and fatty constituents predominate.

Six of the women, of whom two were sterile, one had one child, and three were multiparous, were married, and two were single, the social condition not being noted in the remainder. In one the tumor appeared seven years after the menopause, which occurred at the age of forty-seven; in one at the seventh month of the first pregnancy, and the menses were regular; while in one the catameniæ were irregular at the age of forty-nine. In not a single instance was the manifestation of the growth referable to trauma or heredity.

Myxomata increase more rapidly than fibromata, but less swiftly than sarcomata, although their volume is never so great as is met with in those neoplasms. Even when the entire gland is involved, it is unusual for them to attain the size of a child's head, as in the tumor depicted by

Virchow. In a general way, it may be said that they grow rapidly, since, with the exception of two which had acquired, respectively, the volume of a walnut in six months and of an almond in three years, none are recorded of less size than an egg, an apple, or an orange within the first year of their existence, while one measured three inches and a half by two inches and a quarter in that time. In the case of Moore a weight of upward of five pounds was reached in six years, while in that recorded by Jüngst the size of a man's fist was attained in ten years.

In one-half of all cases pain of an intermittent lancinating nature was met with. In three-fourths of these it was first experienced during the rapid increase of the tumor, while in the remaining fourth attention was called to the growth by the suffering. In one of these cases the tumor presented all the characters of the so-called irritable tumor of the breast.

While myxomata evince no disposition whatever to extend to the deeper structures, they invade the skin in one-half of all instances, as was shown by its positive infiltration in two cases, and by discoloration and adhesion in four. Among these six examples ulceration had also occurred in three. Enlargement—without, however, induration—of the associated lymphatic glands was observed in only one of the twelve cases in which the symptoms are detailed, but, as they were not interfered with, and as the further history of the case after operation is incomplete, it is impossible to say what changes they had undergone.

Of the natural course of myxoma nothing is known, as all the cases were subjected to the knife. Of twelve examples, in which there are more or less finished accounts, one died from the effects of the operation, the tumor having existed for one year; one was well two months subsequently, and the growth was of twelve months' duration; four were well, without recurrence, at the end, respectively, of twelve, eighteen, twenty-six, and twenty-six months; one recurred in fifteen months, and was still living three years and a half from the first appearance of the disease; while five were devoid of further histories, but in these the disease had existed, respectively, six months, twelve months, three years, six years, and fourteen years before removal. In these twelve examples the duration of life, from the first observation of the disease until its termination in recovery or death, varied from six months to fourteen years, and averaged fifty-seven months. Excluding the cases in which death ensued from the operation and the history terminates with recovery from operation, there was one recurrence out of six operations. Hence, it may be said that myxomata are tumors of limited malignity, as they recur in 16.66 per cent. of all instances, but do not occasion metastatic deposits.[1]

[1] As has just been stated, myxoma of the mammary gland, although it recurs after

The clinical features of mucous tumor are by no means characteristic. The great softness and frequent sensation of fluctuation, which distinguish it in other situations, and through which it is liable to be confounded with fatty and cystic growths, are absent in the majority of cases in this locality. Of the eight examples in which the consistence is noted, in only two was it soft; in one it simulated a cyst with thickened walls or had a doughy feel circumscribed by a firmer sensation; while in five it was more or less hard. In one-half of all instances the skin is adherent, discolored, and infiltrated, while in one-fourth it is ulcerated. The axillary glands are enlarged in one case out of every twelve, but the nipple and veins are normal and the tumor is mobile on the chest. In one-half of the cases the patient experiences pain of an intermittent, lancinating character.

Some of these signs, when considered in connection with the mature age at which the growth usually develops, tend to render the diagnosis most obscure. Thus, in the case of De Morgan, which occurred at the age of fifty-six, the enlarged axillary glands, slightly adherent skin, and firm feel of the tumor caused it to simulate carcinoma.

On the whole, a solitary, rapidly and continuously growing, although not bulky, round or ovoid, painful, soft or rather firm tumor, with limited attachment to the skin, but movable on the deeper structures, with a tendency to ulcerate, and, it may be, to discharge a gelatinous material, but unattended with enlargement of the glands or superficial veins, or retraction of, or discharge from, the nipple, and occurring at about the forty-fourth year, may be assumed to be a myxoma.

operation in one-sixth of all instances, does not extend to the walls of the chest or occasion metastatic tumors of the viscera. The paramammary form, or that which starts in the coverings of the gland, is eminently malignant. Thus, Virchow[1] records one which developed upon the breast from a wart at the side of the nipple at the age of nineteen, and in two years formed a polypoid tumor of the volume of an infant's fist; but further details are wanting. Of the four that started in the subcutaneous fat, that of Neumann[2] recurred twice, and the pectoral muscle was the seat of small tubers; that of Péan[3] recurred four times, and the axillary glands were voluminous, but the patient remained well ten months after the last operation; that of Forster[4] invaded the mamma and recurred in two months, and, on death eight weeks later, the muscles of the chest were involved, but the viscera were sound; while in that of Morris[5] there was one recurrence, and, on death in eighteen months from the first observation of the disease, the posterior part of the right lobe of the liver was found to be transformed into a myxomatous mass, as large as a fetal head at full term, which invaded the base the contiguous lung. Hence of the four cases of paramammary myxoma in which there is a further history after operation, all recurred, and one reproduced itself in the liver.

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[1] *Op. cit.*, p. 419.

[2] *Virchow's Archiv*, Bd. xxiv. p. 316.

[3] *Leçons*, etc., *ante*, p. 478.

[4] *Trans. Path. Soc. London*, vol. xxiii. p. 260, and *Guy's Hosp. Rep.*, ser. 3, vol. xviii. p. 48.

[5] *Ibid.*, vol. xxiii. p. 274, and vol. xxiv. p. 120.

The treatment of myxoma differs in no wise from that of sarcoma. On account of its recurring character, enucleation of the tumor should not be resorted to.

Adenoma.

In the connective tissue neoplasms of the mamma, as I have already pointed out, the glandular apparatus is liable to persist and undergo certain changes, such as enlargement of the acini and ducts and irritative hyperplasia of the epithelium—alterations which so thoroughly impressed the older writers with the idea that they were the essential elements as to lead them to regard the tumors in which they were found as being composed of glands of new formation, and to lose sight of the stroma as their possible matricular tissue. Hence, under the term adenoma or some of its antiquated synonyms, as tumeur adénoïde, hypertrophie partielle, adenocele, lobular imperfect hypertrophy, or mammary glandular tumor, Birkett, Broca, Velpeau, Lebert, Bryant, and Paget, and more recently Cadiat and Lannelongue, describe growths which they regarded as being true adenoma, but which differ from that neoplasm in their genesis, intimate nature, and clinical features, and which are composed, for the most part, of transformed preëxisting lacteal glands contained, but widely separated, in a fibrous stroma.

With the exception of myxoma, there is not a single neoplasm which is so uncommon as genuine adenoma, since it was met with, as I have already pointed out, only 3 times out of 995 tumors of the breast. I have examined and described four specimens[1] from the practice of other surgeons, and reported a case of my own, and have collated nineteen additional examples, which serve as the materials at my disposal for writing the life-history and histology of this little understood formation.

The physiological type of adenoma is to be found in a mamma preparing for lactation. During the first pregnancy, and toward its termination, the glandular structure proliferates, through which there is a new growth of acini and ducts throughout the organ; these are contained in a vascular, succulent, loose, and comparatively sparse connective tissue, which is, moreover, rich in cellular elements. Pathologically, a new formation of lacteal glands takes place through a process of budding and extension into the proportionately scant interstitial stroma, so that they preponderate, and represent a simple hyperplasia of the glands as a whole, and not merely of their investing epithelium, as is taught by most authors. These points

[1] *Amer. Journ. Med. Sciences*, Oct., 1879, p. 459, and *Philada. Med. Times*, Jan. 31, 1880, p. 218.

are beautifully shown in Fig. 37, which represents the development of adenoma. All of the acini of a lobule are dilated, so that, instead

Fig. 37.

Development of Adenoma.[1] Dilated and cystic lobule, *, giving off nine prolongations in the form of tubes lined by columnar epithelium, which pursue, as a rule, a parallel course, but now and then divide and anastomose with one another and with offshoots from other lobules, one of which is partially represented at * *. The majority preserved their lumen throughout, although they frequently terminated in attenuated, solid, cellular processes, which sometimes were turned upon themselves. The intertubular young connective tissue was so very scanty that, on transverse section, many of the closely crowded tubules appeared to be separated merely by their adventitia. × 100.

of having a clustered form, the lobule is converted into an irregular cavity, and sends off numerous intercommunicating prolongations or

[1] From a section of an ulcerated and fungating, moderately soft, somewhat lobulated tumor, of the volume of a child's head, of eighteen years' duration, from a spinster fifty years of age, which was removed by Dr. Morton at the Pennsylvania Hospital. It had been stationary for the first eight years, when it began to increase, and at the expiration of twelve months burst and discharged a bloody fluid, when it apparently disappeared. At the end of four months another nodule manifested itself immedi-

hollow cylinders or tubes into the surrounding connective tissue. A neoplasm which presents a likeness to the mamma of a female advanced in gestation may be styled a typical adenoma, as is represented in Fig. 38, from Formad, but it is only a partial likeness, as the

FIG. 38.

Adenoma, showing a transverse section of newly-formed glandular tissue, contained in a relatively sparse fibrous stroma. × 200.

efforts of nature appear to be confined to the excessive production of glandular apparatus, without attempting to unite the acini into distinct lobules attached to excretory ducts. The criterion of adenoma is the presence of the membrana propria, which separates the investing epithelium from the surrounding connective. When it is broken through, and the epithelium grows as solid plugs into the lymph spaces of the stroma, the tumor ceases to be an adenoma and becomes a carcinoma.

From the marked tendency which adenoma has to undergo cystic changes, it usually presents itself as an atypical growth which is characterized by alterations in the shape, dimensions, and grouping of the

ately below the site of the previous one, which, in its turn, at the expiration of two years and a half, opened, and was the seat of a constant discharge, which latterly was profuse, offensive, and bloody. The nipple was retracted, but the axillary glands were normal. After removal, the surface of the growth was uneven and nodular from underlying cysts, which were filled with blood, and the skin toward its base had a purplish tint. The fungus had a breadth of six inches, and the numerous cysts varied in size from a pin's head to a small egg, and possessed thin and blood-stained walls.

enlarged and deformed glands, but in which the membrana propria is preserved. Thus, twelve years ago I removed from the upper and inner circumference of the breast of a prolific married woman, forty-six years of age, a tumor of three years' duration, which was hard, perfectly mobile, bossed, almost spherical, of the volume of a walnut, and unattended with pain, tenderness, or changes in the skin, nipple, veins, or axillary glands. On section, the white, but here and there rosaceous white, basis was dotted, but not to any considerable extent, with cavities, of which none were larger than a small pea, which were filled with a yellowish pultaceous or atheromatous material that could be expressed as plugs. Under the microscope the greatly enlarged acini were seen to be packed, for the most part, with large, round, angular, elongated, and polyhedral cells, which had undergone fatty degeneration in the centre of the largest acini. The connective tissue was present in much less abundance than I have ever witnessed it in a lactating mamma, and it was in parts the seat of small-celled infiltration. Although the dilatation of the acini was similar to that of the secreting breast, the atypical grouping of the large and deformed cells served to distinguish the structure from that of the functionally active mamma, while from the presence of the atheromatous moulds and the exclusive enlargement of the acini the tumor is to be classed as a cystic acinous adenoma, the contents of the cavities being due to caseation of the epithelium.

As I have just pointed out, adenomata are usually composed of enlarged acini, although they may be constituted mainly of newly-formed ducts. When the acini predominate, they may be termed acinous, while they may be called tubular when the ducts preponderate. Of the entire number, six-tenths were cystic acinous growths, of which 85 per cent. were cystic. Hence it appears that pure adenoma is very uncommon, while the cystic acinous variety constitutes the majority.

Adenoma differs from all other neoplasms of the mamma through its wonderful tendency to become cystic, twenty-two of the entire number having undergone that transformation. The contents of the cysts may be fluid or semifluid, and are due to changes which ensue in the proliferating epithelium. In the former event—and ordinary fluid cysts were seen in 44 per cent. of all examples—the secretion may be lactescent, or it may be sanguinolent from the presence of vascular vegetations, or even with the absence of very large vegetations. When the cells undergo advanced fatty changes, as happened in 50 per cent. of all instances, the contents are of a rather dense caseous or atheromatous nature; but the cavities are usually minute, and never attain the volume of an egg, as is witnessed when the contents are fluid. Their size, indeed, rarely exceeds that of a hazelnut, and the

larger cavities are usually formed by the confluence or breaking down of contiguous ones. In 28 per cent. of the specimens the lining epithelium was proliferating to form microscopic intraäcinous vegetations or papillæ, which were purely epithelial in their composition when they were small, but were made up of delicate vascular connective tissue, clad with columnar epithelium, when they completely filled the acini.

With the exception of cystic changes, adenoma does not appear to undergo other degenerations, unless it be the telangiectatic and the myxomatous, both of which are very uncommon. It is, however, rather liable to spontaneous ulceration, as that accident was met with in five instances, and it was threatened in a sixth case. In another case the tumor protruded fungous vegetations as a result of injections of carbolic acid, and in still another the fungus was excited by lancing.

Adenoma is usually ovoid, and invariably bossed or nodulated in outline, but not largely so, and of a hard resistant consistence, although when decidedly cystic it may be uniformly soft and elastic, or, as more often happens, hard, except at the larger bosses, over which it fluctuates. Although it is limited by a distinct fibrous capsule, it is, when of moderate volume, closely and broadly united to or incorporated with the mamma, but its attachment is less conspicuous as it increases in bulk. On section the cut surfaces are smooth, lobed, of a milky-white color, with possibly rosaceous areas, and dotted with orifices or small cavities, to which, after the expression of their contents, is imparted a spongy, honeycomb, or sieve-like appearance. They are frequently occupied by fluid cysts, which, however, rarely number more than three or four, are usually quite small, and rarely exceed the volume of a walnut. They are never pervaded by fissures or slits, nor are they the seat of dilated ducts with intracanalicular solid growths, such as are witnessed in the connective tissue neoplasms, or of yellowish lines or spots, such as are seen in carcinoma.

With a single exception, adenoma was always met with as a solitary tumor, which generally originated toward the upper and inner circumference of the mamma, being found either beneath or in the vicinity of the nipple in only one-third of all instances. It develops as early as the sixteenth and as late as the sixtieth year, the average age of its first observation being thirty-three years. Of 23 examples in which the age is recorded,

4	appeared	between	10	and	19	years.
6	"	"	20	"	29	"
6	"	"	30	"	39	"
5	"	"	40	"	49	"
1	"	"	50	"	59	"
1	"	at			60	"

Of the entire number, not a single one occurred before the sixteenth year, or during the developmental state of the mamma; 16, or 69.56 per cent., appeared previous to the fortieth year, or during the period of the greatest functional activity of the breast; and 7, or 30.44 per cent., after that age or during the functional decline of the gland. 16 of the patients were married when the tumor was first detected, 5 were single, and in 3 the social condition is not stated. Of the married women, 7 were multiparous, 3 had one child, 4 were barren, and the question of children is not mentioned in 2. In none did the neoplasm originate during lactation. With two exceptions, the menstrual discharge was regular in all of the cases in which that function is noted. In one instance the disease was presumed to depend upon a puncture by a needle, and in two upon a blow; in none was it traceable to hereditary influence; in one it was preceded by eczema of, and a milky discharge from, the nipple on the removal of the crusts, which had, however, ceased for nine years; and in one by mammary abscess. The general health of the subjects was excellent.

The increase of adenoma is, upon the whole, less rapid than that of any other of the neoplasms of the breast, and is not influenced by lactation or uterine disorders, although it grew rapidly during pregnancy in two of the twenty-two cases in which the histories are complete. In my own case the tumor attained the volume of a walnut in three years, but it may grow to the same dimensions in three months; and in three cases it was as large as a hen's egg in two, six, and twelve months. Certain writers state that it does not exceed the latter volume, but it may reach the size of a fist in two, five, fifteen, or thirty-six years, or of a child's head in ten months, twenty-three months, or eighteen years, or of an adult head in twelve years. Hence the rate of growth is very variable, but the mode of growth is peculiar in being equable and uninterrupted. As a rule, the increase is so slow that many years may elapse before the tumor attains even a moderate bulk. Thus, in two cases it was scarcely appreciable for, respectively, seven and ten years, while in another it was so excessively gradual that the almond-sized nodule required thirty-three years to reach the volume of an egg, after which it took on so rapid a growth that in three years it equalled the dimensions of a fist. The mode of increase appears also to be singular in that it goes on by the apposition of new nodules to the original

FIG. 39.

Solid Adenoma, showing its lobulated outline.

tuber: this is due to the successive involvement of contiguous nodules, through which the entire mamma may be converted into a bossed or lobulated tumor, as is shown in Fig. 39, from Bryant.

During its further progress adenoma evinces certain signs which, if they are not carefully studied, render it liable to be confounded with sarcoma and carcinoma. Thus, out of the 22 cases in which the histories are complete, the subcutaneous veins were prominent in 3; the skin was discolored in 4, and it was adherent in 6; the nipple was sunken, rather than retracted, in 4, and a bloody or lactescent discharge from that body preceded the detection of the tumor in 4, and could be expressed in 1; ulceration occurred late in the disease in 5; and in 3 of these a red, vegetating, and bleeding fungus protruded through, without being attached to the margins of, the ulcer; and in 2 the axillary glands were enlarged from irritative hyperplasia. In one-half of all cases there is absolute freedom from pain; in one-third of the remainder the suffering is moderate; while in two-thirds the pain is severe and lancinating, especially when the growth has been rapid and the patient is pregnant.

Our knowledge of the prognosis of adenoma is unsatisfactory. In one of Fochier's[1] patients, the parts were perfectly sound six months after operation. In the case of Peter[2] there was no return in twenty-eight months, and in that of Sloan[2] the woman was free from recurrence at the end of two years. Billroth's[3] patient remained well for fourteen years after the enucleation of a tubular adenoma, as did the cases of Heineke,[4] Winckel,[5] and Rushton Parker,[6] respectively, for thirty months, five years, and nine years and two months. In a second case of Winckel's it is stated that the patient remained well, but dates are not given. In one of Labbé's[7] cases local recurrence and enlargement of the axillary glands occurred in less than twelve months, and death ensued at the expiration of three years after the removal of the entire breast, but there was no post-mortem inspection of the body. The disease reproduced itself in the cicatrix in seven months after extirpation of the entire mamma of the patient of Steudener,[8] but she was well thirty-one months after its removal. Of the remaining 14, 2 are entirely devoid of a history of the termination, while 9 recovered from operation and 3 died from its effects. Hence adenoma recurs in 20 per cent. of all cases after operation, but there is no evidence to show that it infects distant organs. The relatively benign nature of the disease is, moreover, demonstrated by the fact that it had existed, on an average, seven years before extirpation, without affecting the general health.

[1] *Lyon médicale*, vol. xiv. p. 142.
[2] *Philada. Med. Times*, Jan. 31, 1880, p. 218.
[3] *Op. cit.*, p. 80.
[4] *Op. cit.*, p. 1.
[5] *Op. cit.*, p. 751.
[6] *Trans. Path. Soc. London*, vol. xxxii. p. 237.
[7] *Op. cit.*, p. 352.
[8] *Virchow's Archiv*, Bd. xliv. p. 42.

One case, indeed, was of nine, one of twelve, one of fifteen, two of eighteen, and one of thirty-six years' standing.

A small adenoma is very liable to be confounded with a small fibroma, but the latter is more distinctly circumscribed and isolable, and far more mobile in or upon the mamma, and its outline is not so decidedly bossed. Upon the whole, the diagnosis of adenoma is based upon its hard and heavy feel, its nodular outline, its pretty intimate attachment to the breast when of moderate volume, its mobility upon the chest, its slow and equable growth, its increase by the addition of small, compact nodules, its occurrence in married and prolific women toward the thirty-third year, the limited discoloration and adhesion of the skin and ulceration late in the disease, and freedom from retraction of the nipple, enlargement of the subcutaneous veins, and involvement of the lymphatic glands. If a tumor which presents these features has been preceded by a discharge from the nipple, there should be little difficulty in arriving at a correct conclusion as to its true nature.

The treatment of adenoma is by enucleation of the small, and removal of the breast for the larger growths, especially if they be ulcerated.

Carcinoma.

The term carcinoma, which is synonymous with carcinomatous epithelioma and cancer,[1] is applied to an infiltrating atypical epithelial new formation which is characterized, clinically, by local infection of the adjacent tissues and associated lymphatic glands and by a marked tendency to general dissemination. A tumor which comprises these malignant attributes consists, structurally, of a cavernous fibrous stroma or framework, the communicating meshes or alveoli of which are occupied by solid nests, plugs, or cylinders composed of loosely-heaped polymorphous epithelial cells suspended in a serous fluid, without the intervention of a cementing intercellular substance.

Although an alveolar fibrous stroma is so important a constituent of carcinoma that Cornil and Ranvier[2] declare that carcinoma should more appropriately be termed alveolar fibroma, it is not, of itself, any more than are the aggregations of cells, a sufficient basis for histological diagnosis. The stroma, which represents, partly, the original framework of the mamma, and, to a greater extent, newly formed connective tissue, is, as a rule, denser than that found in adenoma and sarcoma, but differs in structure and abundance in the varieties of carcinoma. Many of the

[1] The word cancer is employed by the majority of English writers as the equivalent of malignant; but it is used here, interchangeably with carcinoma, to express anatomical, and not clinical, features. There are other tumors of the breast which are quite as malignant as carcinoma or cancer, but which present no structural likeness whatever to it.

[2] *Op. cit.*, p. 111.

alveoli of the latter are, unlike those in adenoma and sarcoma, lined by the endothelial cells of the lymph spaces into which the carcinomatous plugs have grown. The cells, moreover, differ in their vital qualities and chemical properties from normal epithelial cells. They are enlarged and deformed, may possess multiple nuclei, and are very prone to undergo fatty degeneration. Hence, the determination of carcinoma depends upon the combined characters of the cells and stroma and their mutual arrangement.

The histogenesis of cancer is still the subject of dispute; but I am convinced, from examinations of numerous sections of nearly two hundred specimens, that the exclusive view of Waldeyer[1] as to its derivation from the glandular apparatus is correct. Thus, in sections made from the peripheral or developing zone, the acini, and occasionally the ducts, are seen to be enlarged, deformed, and more or less completely filled with proliferating epithelium, and to be surrounded by the membrana

FIG. 40.

Development of Carcinoma: *a*, *b*, *c*, enlarged acini, more or less closely packed with polymorphous cells, the undermost layer of which is columnar. At *b* the membrana propria is intact, while at *a* and *c*, below and to the right, it has disappeared and the cells are extending into the stroma. The connective tissue framework is pervaded by variously shaped, simple or branched, solid cell cylinders, which are the outgrowths of other acini. The cells themselves are merely indicated by their stained nuclei. × 180, reduced one-half.

propria. The periacinous connective tissue is, at the same time, infiltrated by lymphoid cells, so that the entire picture resembles an irri-

[1] *Virchow's Archiv*, Bd. xli. p. 478.

tative or chronic inflammatory process, and is very similar to what I have already described as atypical adenoma. During the second stage the small-celled infiltrate leads to the new formation of connective tissue, while further alterations ensue in the shape of the acini, the epithelial cells change their characters, and the membrana propria disappears. In the final stage, or when the development is complete, the acini, as is represented in Fig. 40,[1] have extended or grown into the new connective tissue and the prœexisting lymph spaces as solid, round, oval, or branching cylinders, plugs, or bodies, whereby the normal appearance of the mammary gland is destroyed.

In none of the numerous sections which I have examined have I ever been able to detect the multiplication of the endothelial cells of the stroma; nor am I a believer in the transformation of the cells of other tissues or organs, in which secondary or metastatic tumors are found, by contact with the epithelial elements of the original growth through some mysterious "action de présence" or "spermatic influence." Although the tubers or nodules in the skin and pectoral muscle, which indicate regional dissemination, are mainly due to the extension of the disease by the lymphatic vessels, as has been demonstrated by Langhans,[2] Waldeyer,[3] and other observers, my own investigations have convinced me that infection also frequently takes place along the perivascular lymph sheaths, as is shown in Fig. 41,[4] in which the lymphatic sheaths of the bloodvessels are more or less closely packed with young epithelial elements, through which their lumen is frequently diminished or even obliterated.

Histologically, the varieties of carcinoma are determined by the relative proportion of the stroma and cells, by certain degenerations and transformations, and by the presence of cysts. The principal varieties are the fibrous, multicellular, colloid, and cystic, the pigmented form not having been met with in the female breast. In the fibrous variety the stroma preponderates, while in the multicellular the cells are in excess. Midway between these stands simple carcinoma, or the carcinoma fibrosomedulläre of Waldeyer, the proportion between the cells and stroma being about equal. The last, however, need not be sep-

[1] From a section of a scirrhous carcinoma of one year's duration, which was removed, along with the infected axillary glands, from a German fifty-nine years of age. The disease recurred in the axilla in five months. Nearly five months subsequently I removed the axillary growth, which was as large as an egg and was composed of sixteen glands. The history of the case may be found in the *Philada. Med. Times*, July 5, 1879, p. 484.

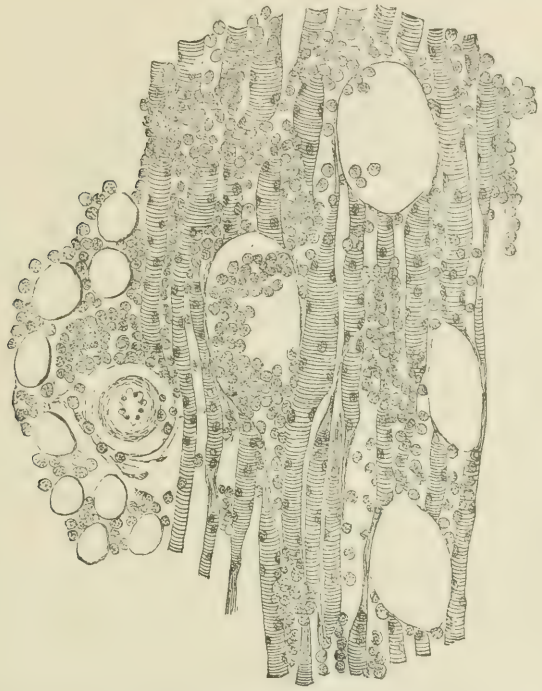
[2] *Arch. f. Gyn.*, Bd. viii. p. 181.

[3] *Virchow's Archiv*, Bd. xli. p. 485.

[4] From a section of a nodule of the pectoral muscle which I extirpated, on account of severe suffering, along with an atrophying scirrhus of fourteen years' duration, and a densely hard axillary glandular tumor, from a prolific married lady forty-five years of age. Her general health was excellent, and she still menstruated. The macroscopic features of the tumor of the mamma are represented in Fig. 56.

arated from the fibrous variety, which it simulates in all its characteristics. A sharp line, indeed, cannot be drawn between them. A can-

FIG. 41.



Extension of Carcinoma into the Great Pectoral Muscle. To the left of the figure is seen a transverse section of an artery, the upper portion of the lymph sheath of which is infiltrated by epithelial cells. The alveoli between the primary muscular fasciculi are due to the absorption or disappearance of the greater portion of the latter from the pressure exerted upon them by the accumulations of cells in the interfascicular connective tissue. At several points the muscle corpuscles are seen to be more abundant than is normal, but this is an irritative phenomenon, and there is no evidence that they participate in the carcinomatous degeneration. The nuclei of the cells alone are delineated. × 300.

cer may not possess the same structure throughout, as one part may be of the nature of ordinary scirrhus, another resemble simple carcinoma, while still another presents the appearances of atrophying scirrhus.

1. FIBROUS OR CONNECTIVE TISSUE CARCINOMA, which is equivalent to the tubular form of cancer of Billroth, the simple carcinoma of Foerster, and to the clinical terms scirrhous, hard, or chronic cancer, includes ordinary scirrhus and atrophying, retracting, withering, cicatrizing, or obsolescent scirrhus, as it is variously termed.

a. In fibrous or scirrhous carcinoma, as is shown in Fig. 42, from Formad, the stroma exists in about the same proportion, or slightly predominates over the collections of cells. The trabeculæ of the former consist either of undulating connective tissue, which may be rich or poor in endothelial cells in accordance with the stage of their development,

or of a nonundulating, faintly fibrous, or entirely homogeneous and refracting tissue. The cells contained in the alveoli do not attain the dimensions of those met with in encephaloid carcinoma, nor are they as liable to fatty degeneration.

Fig. 42.

Scirrhous Carcinoma, showing the alveolar connective tissue framework loosely occupied by continuous epithelial plugs or cancer cylinders. × 250.

β. In atrophying scirrhus, which is called scirrhus by Billroth and the majority of German authors, the epithelial elements undergo fatty degeneration, whereby they are partly converted into a granular emulsion, which is absorbed, while the contracting stroma renders the alveoli smaller and narrower, as in Fig. 43, from Formad, which, in the more advanced stages, are merely represented by a few elongated or fusiform clefts, as in Fig. 44,[1] between the thick tendinous or sclerosed bands

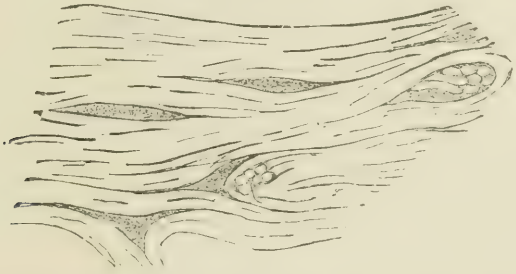
[1] From a section through the centre of a greatly shrunken, discoid, and slightly

FIG. 43.

Atrophying Carcinoma, showing a dense fibrous stroma, which largely predominates over the cell cylinders, induces their atrophy, and leads to spurious cicatrization. × 250.

of fibrous tissue, which contain fatty detritus, or, as is shown in Fig.

FIG. 44.



Atrophying Scirrhus, showing fatty remains of cells, which would not stain, contained in small spaces between thick bundles of fibrous tissue, transverse and oblique sections of which are represented at two points. × 300.

45,[1] one or more rows of unchanged cells. Were it not for the fact

ulcerated breast, which I removed after death, or seventeen years and a half from the first appearance of the growth, from a multiparous widow sixty-three years of age. The skin over the entire thoracic region was pervaded by secondary nodules; the opposite mamma and axillary glands were invaded; the pectoral muscles of the corresponding side were, for the most part, converted into densely hard carcinomatous material, and the axillary and supraclavicular glands were indurated and much enlarged. Both pleuræ and both lungs, the bronchial and mediastinal glands, the opposite half of the diaphragm, and one kidney were the seat of metastatic tumors.

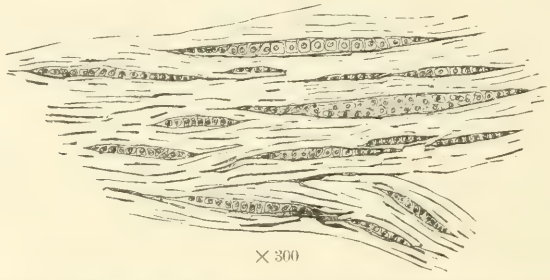
[1] From a section near the advancing margin of a tumor of fourteen years' duration, the history of which is attached to Fig. 41.

that the peripheral zones of the growth disclose the usual structure of scirrhus, atrophying carcinoma might readily be confounded with contracting fibroma.

2. Multicellular Carcinoma is synonymous with the acinous carcinoma of Billroth and the tuberous, medullary, encephaloid, soft, or acute cancer of the clinician, and is characterized by the enormous production of the epithelial constituents, and the relatively small amount of the supporting connective tissue, through which the width of the alveoli is far greater than that of the trabeculæ of fibrous tissue which form their walls, as is seen in Fig. 46, from Formad. The cells themselves are larger, and more liable to fatty changes, than those of any other form of carcinoma. The serous fluid in which they are contained forms an abundant milky juice containing cells, free nuclei, fatty detritus, and oil globules.

In four specimens which I examined the delicate trabeculæ of the stroma were infiltrated by small cells in three, and composed of a

Fig. 45.



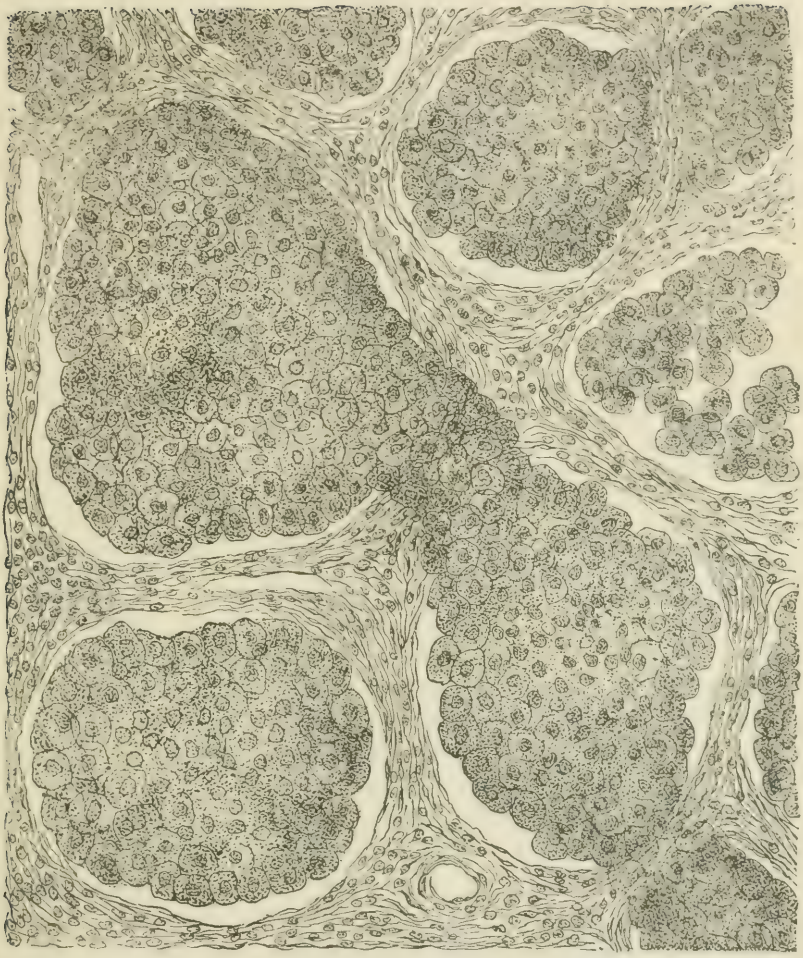
Atrophying Scirrhus, showing long spaces occupied, for the most part, by a single row of cells, and contained between thick bundles of fibrous tissue.

spindle-celled tissue in the other, so that it might with propriety be called a sarcomatous carcinoma. In other specimens the walls of the alveoli are constituted mainly by embryonic bloodvessels surrounded by a thin layer of soft connective tissue, giving rise to telangiectatic carcinoma, or fungus hæmatodes, as it is more commonly termed from its macroscopic features. It should be observed that medullary carcinoma is not always a soft tumor. When the cells have not undergone advanced fatty changes, so that the masses of cells distend the alveoli to the uttermost, it is firm and even hard. Under opposite circumstances, or when the cells have degenerated, and the tension of the alveoli is lessened or lost, the growth is soft and even pseudofluctuating.

3. Colloid Carcinoma.—Colloid, or gelatinous, carcinoma differs from the preceding varieties only in the fact that the protoplasm of its cells, and probably of its stroma, has undergone colloid degeneration.[1]

[1] Although Billroth, Wagner, Klebs, Waldeyer, and other pathologists teach that colloid cancer is merely an ordinary cancer in the highest stage of colloid metamor-

FIG. 46.



Encephaloid Carcinoma. The cancer cylinders are very large, and lie loose in the widely distended lymph spaces. The cells show a marked tendency to fatty degeneration, and the stroma is constituted by thin trabeculæ of connective tissue infiltrated by leucocytes. × 250.

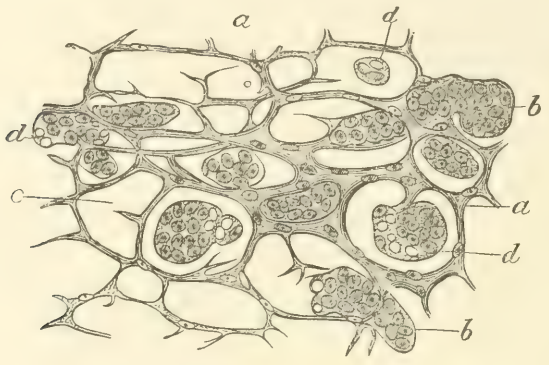
It is sometimes called mucous or alveolar cancer; but as the metamorphosis is not of a mucoid nature, and as all carcinomata are alveolar, these terms are misnomers.

A section of such a tumor discloses that, in its early stage, the heaps of cells are merely separated from the walls of the alveoli by a structureless colloid substance. As the transformation advances, the cells, some

phosis of its cells, Virchow and Lebert hold that it depends upon the colloid character of its stroma; Foerster, Simmonds, and F. E. Schulze, upon colloid degeneration of both the cells and stroma; and Doutrelepont, with whom Rindfleisch appears to agree, upon colloid transformation of the amorphous formative or germinal material, out of which, under ordinary circumstances, the young cells of carcinoma are derived.

of which contain clear colloid globules, as in Fig. 47, from Ziegler, are massed toward the centre of the greatly enlarged alveoli and sur-

Fig. 47.



Colloid Carcinoma, showing stroma, *a*; cell nests, *b*; empty alveoli, *c*; and cells containing globules of colloid substance, *d*. ×250.

rounded by the colloid material, which is marked by concentric circles or layers of dotted lines, as in Fig. 48, from Butlin, the dots representing the nuclei and granular remains of the cells that have been successively invaded by the change. With the still further advance of the metamorphosis the cells disappear entirely, and nothing remains save the lamination or concentric stratification of the homogeneous substance, surrounded by the trabeculæ of the stroma. In none of the accounts of colloid carcinoma of the breast that I have examined have the cells assumed the bandbox or oyster shell appearance that is met with in similar tumors of the other organs, so that the large, refractory, vesicular cells and the lamination are the most characteristic features of the neoplasm. In some cases, indeed, the cells were only the seat of fatty degeneration.

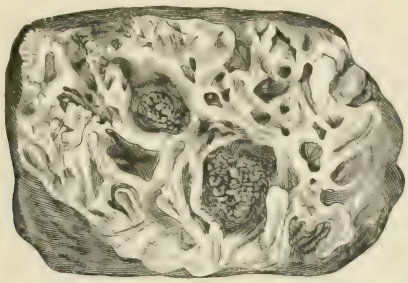
Fig. 48.

Colloid Carcinoma, showing group of cells, one of which contains colloid material, and faint linear markings between the cells and trabeculæ of the stroma. ×250.

4. Cystic Carcinoma.—It sometimes happens, as in a case of my own, that the obstructed and dilated terminal acini and ducts of mammæ which are the seat of cancer are converted into cysts through mucoid or fatty transformation of their epithelium. In addition to these simple retention or involution cysts, that are combined with, although they precede the development of, carcinoma, cysts are

sometimes met with, as in Fig. 49, from a specimen in the Gross Museum, which are more or less completely filled with vascular, epi-

FIG. 49.



Cystic Encephaloid Carcinoma, showing, in addition to simple cysts, two cavities occupied by vegetations.

thelial clad vegetations or papillæ, which are merely protrusions of the periacinous connective tissue into their interior, and are themselves devoid of carcinomatous structure, although Bryant records a case in which the intracystic growths were carcinomatous.[1] Cornil and Ranvier[2] describe this proliferating form as villous carcinoma, while Neumann[3] terms the case which he met with encysted medullary carcinoma. It is not, however, peculiar to soft carcinoma, as a specimen of scirrhus in the Gross Museum, a case of my own, and one recorded by Sprengel[4] show a similar combination; and Wood[5] reports an example of hard carcinoma of the male mamma in which the vegetations were so vascular as to convert the cavities containing them into blood cysts.

In addition to the preceding varieties we may have a myxomatous cancer through mucous transformation of the stroma, or a calcifying cancer through the deposition of the salts of lime in the alveoli and between the trabeculæ of the framework, as in the examples recorded by Ackerman[6] and Creighton;[7] or the fat cells of the stroma may preponderate to such an extent as to constitute a lipomatous carcinoma. These changes, are however, met with to so limited an extent that they can scarcely be said to constitute varieties, although, if it be deemed desirable to notice them, they may be retained as prefixes to indicate subordinate degenerations and transformations.

Besides colloid transformation and calcareous infiltration, carcinoma is excessively liable to fatty and granular degeneration of its cells, and less frequently to casation through atrophy and desiccation of the fatty cells. These changes, which are indicated macroscopically

[1] *Guy's Hospital Reports*, vol. xliii. p. 479, Case 39.
[2] *Op. cit.*, p. 1167.
[3] *Virchow's Archiv*, Bd. xxiv. p. 319.
[4] *Langenbeck's Archiv*, Bd. xxvii. p. 805, Case 113.
[5] *Trans. Path. Soc. London*, vol. xxv. p. 223.
[6] *Virchow's Archiv*, Bd. xlv. p. 60.
[7] *Op. cit.*, p. 169.

by yellow or yellowish-white spots or streaks, constitute the regressive carcinoma of Heinrich Meckel or the reticular carcinoma of Johannes Müller; and they always precede the cicatricial formation met with in atrophying scirrhus. Cystoid spaces or cavities not infrequently result from interstitial hemorrhage and the disintegration of the cells, and the accumulation of a chocolate-colored fluid containing fatty detritus and cholesterin in the softened tumors, over which, if superficially seated, the discolored skin finally gives way. In the event of the bloodvessels of the stroma being attacked by fatty degeneration, these softening cysts also contain extravasated blood.

When cancer takes on rapid growth, and is attended by an extensive small-celled infiltration of its framework, it is prone to inflame, as is indicated clinically by increase of suffering, elevated temperature, and discoloration of the skin. Under these circumstances, and particularly when the tumor develops during pregnancy or lactation, an abscess may form at the expense of the infiltrated connective tissue, the epithelial cells themselves not participating in the morbid process. Even when the mamma is not functionally active, suppuration may ensue, as in the case of a married sterile woman, thirty-nine years of age, whose breast I extirpated in 1879. The tumor, which had acquired the volume of an egg in less than two months, contained an abscess as large as a filbert, filled with greenish pus.

The gross characters of the varieties of carcinoma correspond so closely to their minute features that the true nature of a specimen may be pretty accurately determined by its macroscopic appearances. Ordinary scirrhus, in which the stroma preponderates, has an irregular, rounded, nodular outline, and is frequently flattened or slightly cupped on its pectoral surface, so that it assumes a discoid shape. Its size is moderate, being usually not larger than a small lemon. Its consistence is densely hard and unyielding, and it is heavier than any other mammary neoplasm of equal volume. On section it is crisp and tough, and the cut surfaces contract and become concave, and exude, on pressure or scraping, a milky or turbid granular fluid or juice. The homogeneous, refracting, grayish-white surface is made up of interlacing bands, between which are intercalated yellowish-gray or yellow granular spots or dots and lines or stripes, which are indicative of fatty and caseous degeneration of the cells. At the periphery the section is also marked by pellets of normal fat, from their inclusion in the advancing infiltration. When the proportion between the cells and stroma is about equal the tumor has a bossed outline, and attains a much larger bulk, the volume of a large orange being not infrequent; or it may even measure between five and six inches in diameter, as happened in one of my cases. Its consistence is firm, rather than hard; its section is moderately tough, and the cut surfaces do not become concave. The

juice is more abundant and more grumous, and areas of casea-tion, softening, and increased vascularity are not uncommon.

Medullary carcinoma exhibits the same general characters as the more cellular form of scirrhus, although it is usually lobulated, and attains still larger dimensions, the volume of a child's head being quite frequent. Its consistence is generally soft and elastic, and even pseudo-fluctuating. The firm variety has a homogeneous white surface on section, while the soft form is made up of a grayish-white basis, mottled with pink, red, or brown areas, indicative of increased vascularity and slight effusions of blood. When the tissue resembles a recent coagulum or contains spaces filled with blood, the tumor is termed hæmatoid cancer, which is synonymous with fungus hæmatodes.

Atrophying scirrhus is the most dense, rigid, and inflexibly hard, and at the same time the smallest, of all the varieties. It creaks under the knife, and its cut surfaces are deeply concave, of a tendinous, glistening, bluish-gray lustre, and dotted here and there with pale-yellow granular spots. The juice, if any at all can be expressed, is of a thin and citron-colored serous nature.

Colloid carcinoma is, as a rule, as hard as ordinary scirrhus. Only one specimen in every twenty is soft, and it seldom attains larger dimensions than that variety, a volume of the fist being exceptional, and then only after a very chronic course. The cut surfaces are characterized by an exquisite alveolar structure, filled with a translucent or a cloudy-yellowish, yellowish-gray, or grayish-white, or possibly blood-stained, gelatinous substance.

In cystic carcinoma the cut surfaces are pervaded by cavities, which vary in size from a millet-seed to a walnut, and contain either fluid, caseous, or solid contents, the last being in the form of dendritic vegetations that impart to the section the appearance of a vegetating or proliferating fibroma or sarcoma. The basis of such tumors is usually composed of medullary tissue, although ordinary scirrhous carcinoma is not free from these changes.

As a class, the carcinomatous tumors may be distinguished from the noncarcinomatous by their inseparable connection with the breast, which they infiltrate, so that they are not provided with a limiting capsule; by their containing areas of fat; and by the absence of large intracanalicular vegetations, which are so common in the cystic variety of the latter growths. Scirrhus and atrophying scirrhus are also characterized by the concave appearance of their cut surfaces.

Of the relative frequency of the varieties of carcinoma, it may be said that out of every 100 cases we may expect to find ordinary scirrhus in 87.74 per cent., atrophying scirrhus in 7.92 per cent., encephaloid in 2.93 per cent., and colloid in 1.34 per cent. This statement is based upon 669 cases, including 164 of my own, in which the minute structure

is specified. Cystic carcinoma is so rare that I have met with it only once, and Henry, Hildebrand, and Sprengel each record 1 example, respectively, out of 192, 152, and 131 cases.

Carcinoma[1] never develops before puberty, and I have not seen it before the twenty-fifth year, although Henry reports a case at twenty-one, which is, if I do not mistake, the earliest that has been observed. It is very rare before thirty, after which age it gradually increases to between forty-five and fifty, when it reaches its maximum of frequency, 48.66 years being the average, and then decreases; it is very uncommon after seventy. Of 1622 cases in which the age is noted, the youngest was twenty-one, and the oldest eighty-four years.

37	first appeared	between	20	and	29	years	of age.
268	"	"	30	"	39	"	
605	"	"	40	"	49	"	
488	"	"	50	"	59	"	
199	"	"	60	"	69	"	
24	"	"	70	"	79	"	
1	"	"	80	"	89	"	

Of the entire number, not one was observed during the developmental state of the mamma; 305, or 18.80 per cent., appeared during the period of its greatest activity, or up to the age of forty; and 1317, or 81.20 per cent., began after that age or during its functional decline.

Of 451 cases in which the catameniæ are mentioned, 283, or 62.74 per cent., were menstruating at the date of the development of the disease, and only 8.45 per cent. of these were irregular in the performance of that function.

Of 1545 women in whom the social condition is noted, 1321, or 85.50 per cent., were or had been married, and 224, or 14.50 per cent., were single. Of 1034 in whom it is mentioned, 907, or 87.72 per cent., had borne children, and of these nine-tenths were multiparous; while 127, or 12.28 per cent., were barren. With regard to nursing, I find that, of 416 patients in whom it is referred to, 316, or 76 per cent., had suckled their infants, while 100, or 24 per cent., had not. In nearly 5 per cent. of the fertile women the disease developed during pregnancy or lactation.

The influence of the general health of the patients upon the development of carcinoma is not so marked as some authors teach. Thus, of

[1] The general pathology of carcinoma is based mainly upon an analysis of 1842 cases which have been reported within the past ten years. Of these Oldekop records 250 from Esmarch's clinic; Henry records 192 from the Breslau clinic; v. Winiwarter records 170 from Billroth's clinic; Hildebrand records 152 from König's clinic; Sprengel records 131 from Volkmann's clinic; Fischer records 63 from Rose's clinic; Kaeser records 70 from the clinic of Socin; Kuester, Heineke, Banks, Estlander, Riedel, and I record, respectively, 132, 130, 82, 59, 39, and 207, and 165 occurred in the Middlesex Hospital.

627 subjects in whom the point is noted, 417, or 66.50 per cent., were in excellent health; 129, or 20.57 per cent., were in indifferent or moderately good condition; and 81, or 12.92 per cent., were broken down from the effects of the disease. Hence, even when the patients first come under observation only one-third appear to be injuriously influenced by the progress of the affection; and it may be asserted that the nutrition of scarcely one in twenty suffers previous to sixteen months after the detection of the growth.

Among the profession, as well as the laity, the idea prevails that carcinoma is frequently inherited, but this view is not sustained by a careful analysis of the cases in which this point is mentioned. Thus, a family history of cancer is recorded in 99, or 8.50 per cent., of 1164 cases. A history of cancer in the relatives of cancerous patients does not, however, carry with it a history of inheritance of the disease, so that sisters, brothers, cousins, uncles, aunts, and other connections must be left out of consideration, and the inheritance be traced in the direct line of descent from parents, grandparents, and greatgrandparents. Looking at the subject from this standpoint, in only 55, or 4.72 per cent., of the 1164 cases can the disease be said to have been transmitted. In many of these cases, moreover, the history is based upon the mere statement or belief of the patient, and not supported by the evidence of those who have actual knowledge of the family history. In addition to these facts, the 55 cases demonstrate that the tumor was seated in the breasts of the ancestors in only 27, and that in 10 cases the lips, hand, nose, and œsophagus were the seat of epithelioma. In 3 instances the cancer is noted as being "internal," and in 2 others the seat is not given.

From the preceding data the conclusion is justified that the evidence of the inheritance of cancer is far from being satisfactory. Despite this conclusion, there can be no doubt of the hereditary transmission of the disease, not in the sense, however, of the inheritance of a particulate body, or virus, or germ, or of a blood disease, but of the inheritance of a peculiarity of the structure of the breast, especially of its epithelial elements, which predisposes it to the occurrence of cancer. Thin[1] believes that the vital qualities of the epithelium are feebly developed, through which it is rendered permanently weak and liable to take on the perverted action which gives rise to carcinoma more readily than in persons with normal epithelium. Be this as it may, and I regard the view as being most philosophical, it is certain that cancer is a disease of the obsolete or obsolescent breast. When the affection sets in before the climacteric, the breast is none the less beginning to be useless, in consequence of the changed proportions which exist between its component tissues, the connective tissue stroma predominating. It

[1] *British Medical Journal*, 1883, vol. i. p. 555

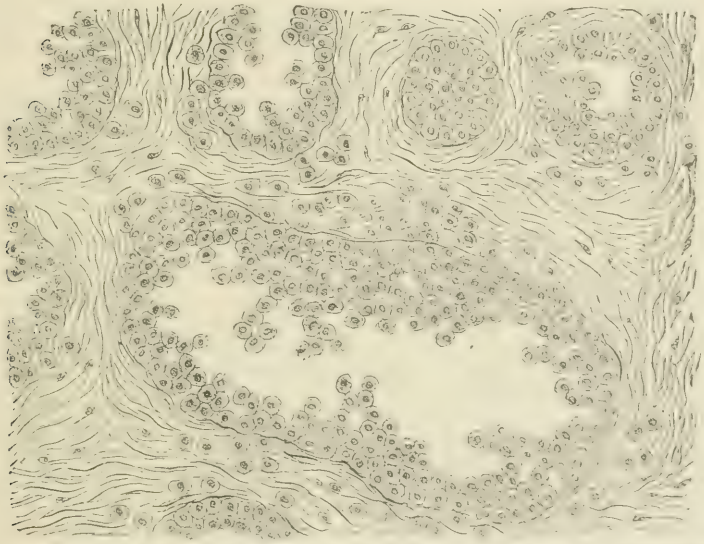
is this peculiarity of structure, along with the weakness of the secreting elements through original fault of development, that is inherited, and the wonder is that the histories of inheritance are not more frequent and more conclusive. That hereditary transmission will in the future be found to be the most powerful factor in perpetuating the disease admits, in my mind, of no question; but it will require many years of careful watching of the children of carcinomatous ancestors before this point can be determined. In conducting these investigations it must be remembered that a tumor of the breast of the descendant of a cancerous ancestor may be of an entirely different nature, since, for example, I find that in not less than 5 of 70 retention cysts there was an unmistakable history of carcinoma in the ancestors. For this reason the diagnosis should be based upon minute examination of the growths occurring in the children of cancerous parents.

Of the causes which favor the occurrence of cancer, antecedent attacks of deep-seated or superficial inflammation of the breast are regarded as being of great importance, and this is especially true of puerperal mastitis and abscess. Of the 907 parous women, 189, or 20.08 per cent., had suffered from puerperal mastitis; but before accepting this bare statement as a proof of a direct connection between the two diseases, there are several points which demand a careful scrutiny. In the first place, the tumor did not always appear on the same side as the inflammation; secondly, the changes produced in the breast by the inflammation are comparatively rarely described; thirdly, the carcinoma has not always been shown to have developed in the portion of the gland that had been inflamed; and, finally, the interval between the inflammation and the appearance of the cancer has usually extended over many years. Of 120 cases of mastitis or abscess in which the histories are clear, the tumor arose in the same breast in 104 and in the opposite breast in 16; but in only 49 could it be demonstrated that it developed out of lumps or circumscribed indurations left by the inflammation. In only 7 cases was the mastitis recent; in the remainder from four to thirty years had elapsed between the inflammation and the appearance of the tumor, the average having been more than fourteen years. These data, in connection with the fact that unmarried and sterile females are free from this cause, render the connection between puerperal mastitis and carcinoma doubtful, although it cannot be denied that mastitis does result in chronic indurations which are made up of dense cicatricial fibrous tissue enclosing glandular elements, thereby giving rise to a structure similar to that of a normal breast during senile involution. Hence, it is not astonishing that, under the influence of the period of life at which carcinoma usually appears, the epithelial elements should not react physiologically, but now and then grow atypically and lay the foundation of cancer.

Nonpuerperal abscess of the breast preceded the development of carcinoma in 1 out of 44 cases from the practice of Rose, and in 5 out of my own 207 cases, in 4 of which the tumor appeared at the site of the abscess. It is also quite probable that deep lesions of the nipple, which continue to be irritated by the nursing child, may exert an influence, as they were present in 14 out of 373 cases in which this point is noted.

Of the remaining precursory conditions of carcinoma, the so-called eczema of the nipple and areola, to which attention was first directed by Sir James Paget, has attracted considerable attention during the past thirteen years. Thin,[1] however, has conclusively shown, and the same point is illustrated in Fig. 50, from De Schweinitz, that

FIG. 50.



Transverse Section of the Nipple, showing the dilated ducts occupied by proliferating epithelium, which at several points is invading the peritubular connective tissue.

the disease is a malignant papillary dermatitis, secondary to carcinomatous degeneration of the epithelium of the mouths of the lactiferous ducts, which leads to destructive changes in the papillary layer of the skin of the nipple and areola, and finally extends along the ducts into the substance of the mammary gland. Hence, the so-called eczema is not a precancerous inflammatory condition, but indicates in reality the early stage of cancer occurring in an unusual situation. Cancer being already present, the morbid condition of the skin is, therefore, an effect and not a cause.

That injuries, such as contusions and blows, are efficient causes of

[1] *Trans. Path. Soc., London*, vol. xxii. p. 218.

carcinoma, by inciting an atypical growth of epithelium in the involuting breast, cannot be doubted. Thus, the affection was ascribed to trauma in 202, or 13.36 per cent., out of 1511 cases; but it should be mentioned that in only 55 is the evidence conclusive that the tumor developed out of indurations or other conditions following the injury, and that in only 9 did the carcinoma immediately follow the cancer. Just how often the repeated irritation occasioned by badly constructed corsets may prove a factor it is impossible to determine.

In reviewing the predisposing and exciting causes of the disease it is evident that the age of the patient, which simply denotes atrophy or senility of the tissues of the breast, local irritation, and inheritance, which implies the transmission of peculiarity of structure, are the only factors of which we have any clear knowledge; so that, in the language of Jonathan Hutchinson,[1] it may be said that "senility gives proclivity, local irritation excites, and, subsequently, hereditary transmission may perpetuate," the affection. The social condition, as declared by Winckel,[2] cannot exert any influence upon the development of carcinoma, since the proportion of single women suffering from it, when compared with that of the married, is not much less than the general proportion of single women; while there cannot be any possible connection between childbearing and cancer, since, of women suffering from carcinoma, the proportion of sterile to parous women is about the same as in health.

Carcinoma usually commences as a small, circumscribed, densely hard, uneven, or nodulated solitary tuber or lump, which is movable under the skin, but fixed in or to the breast itself. In 3.06 per cent. of all cases two or more nodules[3] are met with, and in still more exceptional instances, the disease occurs as an infiltration of the entire gland, especially when it arises during pregnancy or lactation. In 1.31 per cent. of all instances it begins in the lactiferous ducts of the nipple, as Paget's disease or malignant papillary dermatitis.

Of 1664 cases in which the breast affected is noted, the growth occupied the right in 793, and the left in 869, and both breasts simultaneously in 2, so that it is more frequent, by 4.54 per cent., in the left. The seats of election are the upper and outer portions of the gland and the immediate vicinity of the nipple and areola. Thus, of 820 cases in which the locality is mentioned, the tumor occupied—

[1] *British Med. Journal*, vol. i. 1883, p. 553.

[2] *Lehrbuch der Frauenkrankheiten*, p. 765.

[3] It should be remembered that the presence of two or more nodules in the breast does not always indicate that the nodules are of the same nature. Thus, Kuester and Parker have recorded a fibroma and carcinoma, Richet and Paget two fibromata, I myself have met with three fibromata, and Waldeyer has seen eight fibromata coexisting with carcinoma.

The upper hemisphere in	90	The upper and outer quadrant in . .	206
The lower "	51	The " inner " . .	55
The outer "	83	The lower and outer " . .	32
The inner "	32	The " inner " . .	40
		Vicinity of the nipple and areola in . .	231

In not less than 379, or 46.22 per cent., was the tumor seated in the upper and outer portions of the gland, while it occupied the region immediately beneath and around the areola and nipple in 231, or 28.17 per cent. In exceptional instances it develops in an aberrant or outlying lobule just below the clavicle, near the sternum, or in the axilla, so that when met with in the last locality the tumor has been described as originating in an axillary lymphatic gland.

The increase of carcinoma, when compared with the other mammary neoplasms, is slow, so that it rarely attains any considerable bulk. In ordinary scirrhous and colloid cancer the tumor is usually smaller than the gland or portion of the gland that it has replaced; in that form of scirrhus in which the fibrous and epithelial constituents exist in about equal proportion, the volume of a small fist is not uncommon, and it may even measure five inches and a half in diameter, as happened in one of my cases which had lasted three years before it was extirpated; in withering scirrhus the tumor is rarely as large as a walnut, while in medullary carcinoma the size of a child's head is not uncommon. Hence, the volume depends upon the relative proportion of the component constituents, being large when the cells predominate, and small when the fibrous stroma is in excess.

The rate of growth is not, contrary to the generally received opinion, influenced by the early age of the patient, since I have failed to discover that the increase is more rapid before the age of forty than when the tumor develops later in life. When, however, carcinoma appears during pregnancy or during lactation, its growth is wonderfully rapid, and its course is excessively malignant, of which facts several striking instances are recorded by Klotz,[1] Paget,[2] and Henry.[3] In the case of a lady under my own care a tumor of the volume of a small walnut was accidentally detected in the sternal portion of the left breast in the sixth month of her first pregnancy. In two weeks the entire breast was involved, and when I saw her, twelve weeks after the first observation of the disease, the breast was firmly fixed to the chest, the skin was adherent, thick, brawny, and pervaded by stuffed lymphatics, and the axillary, as well as the supraclavicular, glands were extensively invaded. In a remarkable instance reported by Billroth[4] the disease

[1] "Ueber Mastitis Carcinomatosa Gravidarum et Lactantium," *Inaug. Diss.*, Halle, 1869.

[2] *Op. cit.*, p. 639.

[3] *Op. cit.*, p. 80.

[4] *Chir. Klinik.*, Wien, 1871–76, p. 258.

developed in both breasts five weeks before the woman's eighth confinement; and on death, seven days after an easy and natural delivery, or six weeks after the first observation of the disease, the mammæ were larger than a child's head, and secondary deposits were found in the thyroid gland, pericardium, liver, omentum, and kidneys.

During its further increase—and it grows by progressively invading or infiltrating the tissues at its periphery—or when it has attained only a moderate volume, carcinoma evinces signs which are of great diagnostic value even before the contiguous structures are visibly contaminated, and which are referable to its tendency to contract or draw the component tissues of the breast itself and the adjacent structures into its midst—a tendency due to cicatricial or atrophic changes going on in its older or more central portions.

Among the earliest of these phenomena, particularly when the tumor is superficial, is a dimpling or pitting of the skin. This pitting is entirely independent of carcinomatous adhesion between the skin and the growth, and arises from shortening of the fibrous bands or processes of the superficial mammary fascia which pass from the posterior surface of the skin into the interior of the breast, and which Sir Astley Cooper called the suspensory ligaments. This sign, along with the age of the patient and the consistence of the growth, has enabled me, in several instances, to diagnosticate the true nature of a tumor not larger than a small filbert.

In 5.22 per cent. of the noncarcinomatous neoplasms of the breast the nipple is buried, displaced, or sunken, simply for the reason that the tumor grows beyond its level, so that by pushing back the former the nipple, as a rule, again partly protrudes. In carcinoma, on the other hand, the mammilla is permanently retracted and fixed, as is shown in Fig. 51, because the contracting growth draws it toward itself by shortening the milk ducts which terminate at its extremity; and this process is the more apparent when the neoplasm develops in the immediate vicinity of the lacteal sinuses, or when the nipple itself is infiltrated and becomes the seat of cicatricial contraction. In my own 207 cases—and writers, strange to say, rarely refer to this point—a retracted nipple was observed in not less than 108, or 52.17 per cent., the large proportion being due to the fact that in 75 the carcinoma was seated in the immediate vicinity of the mammilla and areola. As the nipple is sunken in only 5.22 per cent. of the noncarcinomatous neoplasms, I regard it as a sign the value of which cannot be overesti-

Fig. 51.

Scirrhus, showing retraction of the nipple.

mated. In one of my patients it was the first feature, along with a straw-colored discharge, that directed attention to the disease.

In 15 of my 207 cases there was a spontaneous discharge from the nipple, the fluid being, as a rule, either watery or bloody or thick and lactescent, while in two additional cases a thick, milky fluid, the so-called cancer-juice, could be expressed. In one-third of the cases the discharge preceded the detection of the tumor.

To the same cause, or intraction of, combined with pressure upon, the nervous filaments which supply the breast, may be ascribed the pain of which patients so commonly and so early complain. Usually of an intermittent, darting, pricking, or neuralgic character at the outset, the suffering becomes more constant and aggravated with the progress of the disease, and particularly when the skin is extensively invaded and ulcerated, the lymphatic glands infiltrated, and the arm swollen, until finally it is frequently atrocious, extending in various directions, as, for example, to the shoulder, neck, back, and arm, interfering with sleep and nutrition, and hastening the fatal issue. In 4 per cent. of all cases there is absolutely no suffering whatever; in 8 per cent. there is merely a sensation of discomfort or weight; while in 88 per cent. there is real pain, which varies, however, greatly in intensity and character.

With the further advance of the disease, but not, on an average, before the expiration of fifteen months after its first observation, marked changes ensue. These indicate, first, local infection, or regional dissemination, through the extension or growth of young epithelial cells, along the course of the lymphatics and perivascular lymph sheaths, into the adjacent tissues; and, secondly, the transfer of the cells by the lymphatic vessels to the associated lymphatic glands. These changes, when regarded in their chronological order, are invasion of the skin, the glands, the muscles of the chest, the ribs, the pleura, the anterior mediastinum, and the opposite breast.

Infection of the contiguous tissues shows itself either in the form of adhesion or fixation of the tumor to the skin and walls of the chest, or as distinct nodules or tubers which are visible to the naked eye when superficial or are detected during operative procedures.

Of the 1414 cases in which this point is noted, invasion of the skin, as evinced by its adhesion or discoloration, was met with in 599, or 42.36 per cent.; by the formation of tubers in 152, or 10.44 per cent.; and by ulceration in 338, or 23.90 per cent.; so that, omitting the cases in which two or more of these features are present, it is involved in 62.26 per cent. of all instances. In the majority of cases the skin is adherent, thinned, and of a purplish, bluish-red, or dusky-red tint, with enlargement of its small vessels, and the seat possibly of superficial and limited desquamation, conditions which precede ulceration.

In some examples it is thick, rigid, and brawny, like the skin of a lemon or the rind of bacon, and now and then œdematous, and pervaded by varicose lymphatics, which may be plugged with epithelial cells or merely obstructed by lymph cells, or it may be drawn in so as to resemble a cicatrix. When nodules form, they may present the appearance of flat, irregular plates; but they are usually shot-like or pea-like or biconvex, and frequently attain the size of a hazel-nut or a small hickory-nut, and are covered by discolored skin. Occasionally, and particularly when the subcutaneous connective tis-

FIG. 52.

Local Dissemination of Scirrhus.[1]

sue is simultaneously involved, they form large masses, as in Fig. 52, from one of my cases, which extend beyond the middle line

[1] Eliza C——, aged fifty-five years, the mother of two children, ceased to menstruate fourteen years ago, and was not aware of a family history of cancer. About two years ago, while washing the right breast, she accidentally noticed a firmly fixed, painless growth, as large as an English walnut, two inches above and to the right of the nipple. She remained in this condition for twelve months, when the skin around the base of the mammilla became ulcerated, and discharged a thin and fetid fluid. Excessive pain of a darting and cutting nature manifested itself at the same time, and had con-

of the chest, involve the opposite breast, ulcerate, produce great suffering, and finally convert the front and sides of the thorax into a mass of offensive disease. Under these circumstances the tubers need only undergo atrophic changes to constitute the affection known as cancer en cuirasse, which is met with once in every twenty-two cases. When withering does not ensue, the affection is termed lenticular cancer by Schuh, and pustular or disseminated scirrhus by Velpeau, and the disease may extend to the neck, shoulder, arm, abdomen, and back. In other cases, by the union of the nodules with the main tumor, and by their progressive growth, the breast is converted into a large bossed mass.

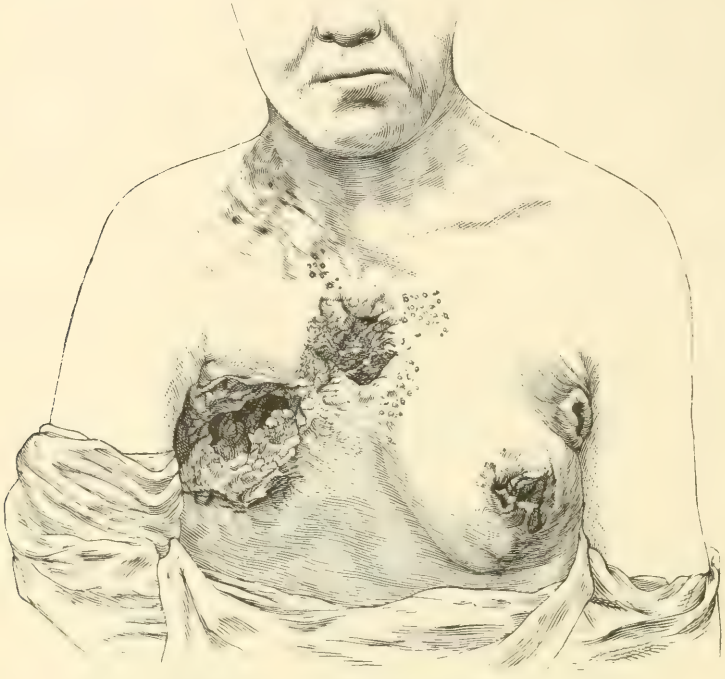
Invasion of the skin is the earliest perceptible sign of local malignity, but it may be delayed for seven or eight years. I have met with it as early as two weeks; but the average date of its appearance is 15.8 months, which is the mean of 13.9, 14.4, 15.8, 13.6, 25.1, and 12 months, recorded, respectively, by Winiwarter, Oldekop, Sprengel, Hildebrand, Heineke, and myself. According to the observations of Heineke, Sprengel, and myself, the skin becomes adherent 1.5 months before the formation of nodules or tubers.

Although I have included ulceration among the phenomena of infection of the integument, many ulcers result from fatty and disintegrating changes which take place in the substance of the tumor itself. Hence the process may be superficially or deeply seated. In the former event the thinned and discolored skin is at first cracked, fissured, excoriated, or eroded, and covered by thin crusts. Ere long a sore forms which has a pale granulating base and discharges a thin, offensive fluid. Now and then it heals over, the cicatrix being thin, tense, red, and

tinued ever since, with remissions in severity. She stated that the original tumor gradually disappeared, and that small lumps, "like peas," made their appearance in the skin to the inner side of the affected breast, and extended to the left breast nine months ago. The entire anterior surface of the thorax looked as if it had been converted into an irregular fungous mass, covered here and there with drops of blood and yellowish pus. On closer inspection, however, the red and prominent nodules and bosses were seen to be free from the ordinary appearances of fungus, their surface being, for the most part, merely excoriated or fissured, while some were covered by crusts. To the touch they were firm, and somewhat elastic and tender. Varying in size from a small shot to an orange, they were multiform, convex on both surfaces, and inseparably connected with the chest. The discharge was profuse, and had a sickening odor. Some of the nodules showed distinct evidence of cicatrization of the superficial ulcers in the form of a thin epithelial covering, while one was sloughing off. The original breast and tumor were converted into a large, red, thin, adherent cicatrix. Of the left breast nothing remained except its lower half with the deformed nipple. Three small nodules of carcinoma were seated in the skin over the summit of the left shoulder, and were quite independent of the main mass. The supraclavicular glands of the right side were contaminated, and a cluster of hard glands, as large as an egg, occupied each axilla. The woman's general condition was excellent. Death ensued eight months subsequently, or thirty-two months from the date of the detection of the disease.

traversed by small vessels, or healing occurs in the first breach of continuity, while the ulceration continues to spread. In the second form

FIG. 53.



Local Dissemination and Ulceration of Scirrhous Carcinoma.[1]

of sore, or that which ensues from the breaking down of the tumor, there is, as delineated in Fig. 53, from a clinical case, a deep, exca-

[1] From a married and prolific female fifty-two years of age. The disease was of two years' duration, was traceable to heredity and trauma, and was first noticed two years after the menopause as a small tumor beneath the retracted nipple of the right breast. In four months there was a thin and bloody discharge from the mammilla. The glands of the corresponding axilla were enlarged in ten months, and in twelve months along the posterior border of the sternomastoid muscle and in the supraclavicular fossa. At the same time a nodule appeared in the skin of the upper sternal region. In fifteen months the disease had disseminated itself in the form of small nodules in the skin over the greater part of the right chest, a tuber appeared in the left mamma, and the left axillary glands enlarged. In seventeen months the sternal, left mammary, and left axillary tumors ulcerated spontaneously. Her health had failed during the last six months. She was frequently nauseated, and vomited after meals; the appetite was poor; and she suffered great pain in both breasts, the neck, and the right arm.

As a result of caustic applications the right mamma and a portion of the axilla were replaced by a huge, irregular, deep, funnel-like ulcer, with everted, indurated edges, showing here and there evidences of cicatrization and a granulating surface, which bled readily on changing the dressings. The mass over the sternum consisted of two large, hard, and red tubers above, and of a superficial ulcer below as large as a silver dollar. The outer half of the left breast was converted into a densely hard tumor, which was ulcerated around and at the outside of the nipple, the latter of

vated, or crater-like cavity, with irregular, discolored, full, indurated, and everted edges, and a base which is usually formed of hard granulations and which discharges a puriform, bloody, foul, or ichorous fluid.

The ulcer of carcinoma differs from that of the other mammary neoplasms. In myxoma and sarcoma especially the sore may be deep and excavated and its walls composed of disintegrating tumor tissue; but the ulcer of the simple growths is essentially a fungating one—that is to say, it is attended with the protrusion of pedunculated masses, which are not attached to the sides of the ulcer. The edges of the ulcer are, moreover, smooth, even, and free from discoloration and infiltration. Although carcinoma is said to throw out fungous masses, I fancy that the statement is mainly traditional.

I have witnessed ulceration as early as 2 months, but it usually declares itself, on an average, in 19.9 months. Winiwarter fixes the mean date of its appearance at 17.7 months, Oldekop at 26.4 months, Sprengel at 20.3 months, Heineke at 19.3 months, while my cases averaged 15.8 months.

Of the signs of local infection, the next in order of frequency is invasion of the deep tissues, as indicated by infiltration of the pectoral fascia or the formation of distinct nodules in the pectoral and intercostal muscles and ribs, which corresponds to the fixation or adhesion of the tumor to those structures. Of 1020 cases in which this point is noted, the mamma was mobile in 860, and more or less closely adherent in 160, or 15.69 per cent. In the latter class of cases distinct tubers were also found, on operation, in 1 case out of every 9.3 in the pectoral muscles, in 1 out of every 73.6 in the intercostal muscles, and in 1 out of every 37 in the ribs. In 1 case out of every 12.3, nodules were present in the paramammary fat.

Immobility of the tumor on the subjacent tissues is witnessed, on an average, in 21.9 months, which is the mean of 22.7, 23.4, 24.8, and 16.9 months, recorded, respectively, by Winiwarter, Oldekop, Heineke, and myself. Hence, it will be observed that fixation of the growth ensues 6.1 months after adhesion to the skin and 2 months after ulceration. I have myself met with it as early as the second and as late as the twenty-seventh month. It, moreover, usually coexists with infection of the lymphatic glands, the presence of which may be suspected, if they cannot be felt, whenever fixation of the tumor declares itself.

which was partially destroyed. The skin was infiltrated, below and at the outer side, by flattened plates of carcinomatous material. The glands of the left axilla formed a dense, round tumor, as large as a small apple, and the skin was superficially ulcerated, the edges of the sore being excessively hard and livid. The integument of the sternal border of the left mamma, around the sternal growth, and over and below the right clavicle, was occupied by numerous shot-like and lenticular deposits, a few of which were as large as a filbert. The supraclavicular glands and the glands beneath and over the right sternomastoid muscle were converted into secondary tumors.

Among the more uncommon evidences of local dissemination is the invasion of the opposite breast, which is noted in 48, or 2.85 per cent., of 1681 cases. Although I have included this as one of the symptoms of local extension of the disease, it is highly probable that, in the majority of the cases, the disease was independent of the tumor of the first breast affected. Be this as it may, implication of the other breast is a late sign, appearing, on an average, at 29.8 months, although it is witnessed as early as four months, and as late as six years. Of 28 cases of which I have the full particulars, in 24 it was preceded by enlargement of the glands; and in 13 of these there were also nodules in the skin, and ulceration was present in the original tumor in 7. In 2 cases there was no glandular involvement, but in both the disease was preceded by cutaneous tubers and by ulceration of the primary growth. In 2 there were no complications.

From the preceding facts we learn that carcinoma evinces a remarkable disposition to infect the adjacent tissues, and that it progresses at first toward the surface. The skin is invaded in 66.26 per cent., deep attachments ensue in 15.69 per cent., and the opposite breast suffers in 2.85 per cent. of all instances. The occurrence of local dissemination is, moreover, indicated by the formation of circumscribed nodules in the skin in 10.44 per cent.; in the paramammary connective tissue in 8.13 per cent.; in both of these situations, as in the cuirass form of cancer, in 4.57 per cent.; in the pectoral muscles in 10.77 per cent.; in the intercostal muscles in 1.35 per cent.; and, finally, in the ribs in 2.7 per cent.[1] In the order of the date of their appearance we may look for extension to the superficial fascia and skin in 15.8 months, for ulceration in 19.9 months, for fixation to the chest in 21.9 months, and for invasion of the second breast in 29.8 months. These facts, elicited by clinical and post-mortem evidence, have an important bearing upon the question of glandular infection and the formation of secondary growths in the internal organs. Thus, of the 192 cases of local dissemination, recorded by v. Török and Wittelshöfer, invasion of the glands was met with in 52.6 per cent., and metastases were discovered in 72.9

[1] These points are still further illustrated by v. Török and Wittelshöfer from the records of 366 post-mortem examinations of women dead of carcinoma of the breast, an account of which may be found in *Langenbeck's Archiv*, Bd. xxv. p. 873. In 184 an operation had been performed, while 182 ran a natural course. Of the entire number, 192 were marked by local dissemination or regional infection. The skin was invaded in 148, or 40.43 per cent., in 38, or 10.38 per cent., of which nodules were present, and in 110, or 74.32 per cent., of which ulceration had taken place. The chest muscles were infected in 80, or 21.86 per cent; tubers were found in the pectoral in 58, or 15.84 per cent., and in the intercostals in 22, or 6.01 per cent. The bony walls of the chest were affected in 52, or 14.20 per cent., the ribs being involved in 29, or 7.92 per cent., the sternum in 20, or 5.46 per cent., and the clavicle in 3, or 0.82 per cent. The pleura was involved in 25, or 6.08 per cent., the pericardium in 2, or 0.54 per cent., the mediastinal glands in 24, or 6.55 per cent., and the opposite breast in 33, or 9 per cent

per cent. Of the 174 cases, on the other hand, which were free from local infection, the glands were affected in 42.5 per cent., and metastases had occurred in 45.4 per cent. Hence, it appears that the occurrence of glandular and systemic infection is greatly favored by local dissemination. All of these data must be considered in deciding the question of operation, to which reference will again be made under the head of Treatment.

Invasion of the Neighboring Lymphatic Glands.—The reproduction of carcinoma in the associated lymphatic glands is one of the most practically interesting of its malignant features, and exerts a decided influence upon the course of the disease, upon the formation of metastatic deposits, and upon the final issue after operative procedures. As the loose collections of cells are contained in the lymph spaces of the mammary gland, which are the radicles of the lymphatic vessels, one can readily conceive how easily, and, indeed, how inevitably, as is so well illustrated in Fig. 54, from Cornil and Ran-

FIG. 54.

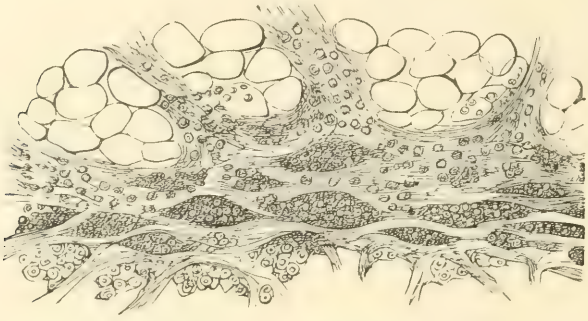
Carcinoma of the Mammary Gland, the Ground Substance of which is stained with Nitrate of Silver: *a, a*, alveoli of the carcinoma filled with cells; *b, b*, lymph spaces; *c*, lymphatics, showing silver staining of the endothelium. × 150.

vier, the young epithelial elements are transported to the lymphatic glands in the axilla and above and below the clavicle, where they implant themselves, proliferate, and reproduce the likeness of the parent growth. When the glands are affected, they delay[1] for a certain period, on the one hand, metastatic deposits, and, on the other hand, constitute new foci of local and general infection. Hence the

[1] Von Török and Wittelshöfer, *op. cit.*, p. 880, show that in 20 per cent. of all examples of invasion of the glands metastatic tumors are absent.

cells of a packet of indurated and enlarged glands behave precisely like the primary tumor; that is to say, they invade the surrounding tissues, as shown in Fig. 55, from Billroth, and infect the adjoining

FIG. 55.



Cellular Invasion of the Tissues around a Carcinomatous Lymphatic Gland. × 350.

glands and the viscera. Just how often the glands enlarge as a result of inflammatory or irritative hyperplasia, as is witnessed in other mammary neoplasms, I am unable to say; but it is very certain that they are not always carcinomatous, since, as I shall show hereafter, several cases are on record in which, having been left behind during operations, they have subsided, and the patients were living several years—in one case, indeed, ten years afterward—free from disease.

Out of 1638 cases in which it is mentioned, glandular infection was witnessed in 1115, or 68.07 per cent., when the patient first came under observation. In all of these cases the axillary glands were affected, and along with these the supraclavicular glands were involved in 5.44 per cent., the subclavicular in 1.34 per cent., and the cervical in $\frac{6}{10}$ of 1 per cent.

Of the 366 post-mortem examinations recorded by von Török and Wittelshöfer,[1] the axillary glands were infected in 175, or 48.08 per cent., the supraclavicular in 4.1 per cent., and the cervical in 4.1 per cent. The smaller proportion is, doubtless, due to the fact that one-half of the cases had been subjected to operation.

Carcinomatous degeneration may occur in a few weeks or may be delayed for seven years. In 136 examples I myself have witnessed it as early as two weeks and as late as five years, the latter being an instance of atrophying scirrhus. About 1 case in every $4\frac{1}{3}$ is met with in the first six months; but the average date of its appearance is 14.7 months, which is the mean of 14.7, 16.5, 9.7, 14.3, 20.6, and 12.8 recorded, respectively by Winiwarter, Oldekop, Heineke, Sprengel, Fischer, and myself. Hence, it antedates invasion of the skin by one month, ulcera-

[1] See note on preceding page.

tion by five months, deep adhesions by seven months, and extension to the opposite breast by fifteen months. In exceptional instances it is even observed before the primary tumor is noticed.

A point of interest, and it is one which must have attracted the attention of every surgeon, is, that the seat of the carcinoma exerts no influence upon the frequency or the date of the appearance of the lymphatic tumor. In other words, the glands are not involved earlier or oftener when the original growth is near the axilla than when it occupies the inner periphery of the mamma.

While it is an established fact that the cases uninfluenced by operation, in which the gland contamination does not evince itself until late, pursue a more chronic course, and do not perish nearly so quickly as those in which the glands are infiltrated early in the affection, statistics show conclusively not only that the chances of removing the entire disease are greatly lessened when the glands are enlarged, but that, as in the former instance, the patients succumb much sooner, and that recurrence is far more rapid. Thus, of 136 subjected to operation, 43 were free from glandular tumors, and their average life from the first observation of the disease to the fatal issue was 52.7 months. Among these patients local reproduction ensued, on an average, in 8 months. Of 93 in whom both the breast and the glands were removed, the mean life was 39.3 months and the average time of recurrence was 1.9 months. Hence, the former lived 13.4 months longer than the latter, and when there was recurrence it appeared 6.1 months later.

The number of glands involved is sometimes enormous, being greater even than the study of normal anatomy leads one to conceive. Thus, from a woman forty-eight years of age, in whom the disease had existed eighteen months, fifty glands, which varied in size from a small shot to a hazelnut, were removed. On her return to the clinic, ten weeks subsequently, the disease was found to have recurred at the edge of the pectoral muscle, in the axilla, and in the supraclavicular glands.

In the majority of instances the glands are separate and distinct. In others they constitute a densely hard, conglomerate, knobby mass; while now and then the disease is confined to a single gland, which may, as in a case of my own, measure three inches and a quarter by one inch and three-quarters in its long and short diameters.

Metastatic Deposits.—After invasion of the lymphatic glands the cells pass into the circulatory system, are transported to the viscera, the bones, and other tissues, in which they proliferate, reproduce the likeness of the primary growth, and in this way develop metastatic deposits or growths. General dissemination may, however, manifest itself without antecedent glandular infection, but such a course is exceptional. Thus, of 61 post-mortem inspections in which systemic secondary tumors were discovered, the intervening glands were involved in 52, or 85.24 per cent.; in 2, or

3.27 per cent., there were merely tubers in the skin and pectoral muscle; while in 7, or 11.47 per cent., there were no primary complications whatever. Hence, in about 1 case in every 7 metastasis occurs without implication of the glands; from which it appears that infection may take place through the bloodvessels, and that the absence of enlarged glands affords no absolute guarantee that the viscera are not already invaded. The presence of metastatic tumors without antecedent glandular infection is also demonstrated by the investigations of von Török and Wittelshöfer. Thus, of 175 cases complicated by infected axillary glands, secondary growths were found in 57.7 per cent., while of 191 cases without glandular involvement, metastases had occurred in 62.3 per cent.

Of the frequency of metastatic deposits our knowledge is not satisfactory, for the reason that it is by no means easy to follow our cases or to obtain post-mortem examinations. My own observations in this respect are worthless, as I was enabled to make a section in only one case, it being one of atrophying scirrhus which had lasted for upward of seventeen years, and in which I detected tumors in the lungs, the pleura, the bronchial and mediastinal glands, and the right kidney. The tables of Winiwarter, Oldekop, Henry, Kaeser, Kuester, Sprengel, Riedel, Estlander, Fischer, and Hildebrand, however, contain 134 cases of general dissemination confirmed by section after death, and 70 cases in which that condition was determined by well-marked symptoms during life. They were distributed as follows:

Died without operation .	74	Metastases in	11	Presumed metastases in	6
Died from the effects of operation	168	"	15	"	"	0
Died with recurrence after operation	435	"	72	"	"	49
Died with metastases, but without recurrence after operation	36	"	36			
Died with presumed metastases, but no recurrence after operation .	15		...			15
	728		134			70

Hence, of 728 patients, metastatic deposits had formed, or were presumed to have formed, in 204, or 28.02 per cent. As indicated by section, they were present in 51 per cent. This latter point is interesting, as it denotes that death ensues in one-half of all cases merely from the baneful effects exerted upon the nutrition of the patient without cancerous degeneration of the viscera, or from intercurrent diseases, of which the most common are pleuritis, tubercle, and pneumonia.

The date at which metastases form varies from five months to eight years. Out of every 100 cases 24 will be found within a year; 3 in

from thirteen to eighteen months; 18 in from nineteen to twenty-four months; 27 in from twenty-five to thirty-six months; and 28 after three years. Winiwarter, Henry, Oldekop, and Sprengel compute the average date of death from metastases from the first appearance of the disease, respectively, at 23.7, 31.7, 38.2, and 24 months, so that the general mean is 29.4 months, or 14.7 months after glandular infection.

In the 114 cases in which sections were made after death the relative frequency of the seats of the secondary deposits is shown by the following statement:

Dura mater	in 3 cases.	Ovary	in 3 cases.
Pleura	" 17 "	Uterus	" 1 case.
Pericardium	" 2 "	Bladder	" 1 "
Brain	" 3 "	Peritoneum	" 1 "
Lung	" 41 "	Omentum	" 1 "
Œsophagus	" 1 case.	Bones	" 18 cases.
Stomach	" 11 cases.	Muscles	" 2 "
Intestines	" 2 "	Bronchial glands	" 3 "
Liver	" 42 "	Mediastinal glands	" 4 "
Spleen	" 5 "	Retroperitoneal glands	" 5 "
Kidney	" 5 "	Mesenteric glands	" 2 "
Adrenal	" 1 case.		

With a view to determine the relative frequency of the locality of the metastatic growths from a larger number of cases, I have obtained the following results by adding to the 114 cases 89 compiled by Arnold, Morris, and Clark from the registers of the Middlesex Hospital and 220 recorded by v. Török and Wittelshöfer. Thus, of 423 post-mortem inspections, secondary tumors were discovered in the—

		Per cent.			Per cent.
Dura mater	in 25, or	5.9	Stomach	in 20, or	4.7
Brain	" 40, "	9.4	Intestines	" 8, "	1.8
Spinal cord	" 1, "	0.2	Pancreas	" 7, "	1.6
Pericardium	" 19, "	4.4	Omentum	" 6, "	1.2
Heart	" 4, "	0.9	Œsophagus	" 1, "	0.2
Venous system	" 4, "	0.9	Kidney	" 24, "	5.7
Bronchial glands	" 15, "	3.5	Adrenal	" 8, "	1.8
Mediastinal glands	" 4, "	0.9	Bladder	" 3, "	0.7
Retroperitoneal glands	" 23, "	5.4	Ureter	" 1, "	0.2
Mesenteric glands	" 14, "	3.3	Mamma	" 33, "	7.8
Lung and pleura	" 38, "	8.9	Uterus	" 22, "	5.2
Pleura	" 178, "	42.0	Ovary	" 34, "	8.0
Lung	" 475, "	41.0	Tubes	" 4, "	0.9
Thyroid gland	" 8, "	1.8	Vagina	" 2, "	0.4
Liver	" 206, "	48.6	Bones	" 87, "	20.5
Peritoneum	" 20, "	4.7	Muscles	" 3, "	0.7
Spleen	" 20, "	4.7			

It will thus be seen that the digestive, respiratory, osseous, and nervous systems are the seats of predilection, and that the lungs suffer rather more frequently than the liver.

In connection with the occurrence of secondary deposits attention may be called to what Herbert Snow[1] calls "a neglected symptom in breast cancer;" that is to say, a thickening of the upper end of the humerus, with tenderness on pressure, which he declares sets in, in the majority of cases, simultaneously with enlargement of the axillary glands, and which he ascribes to carcinomatous invasion of the medulla. I have faithfully tested this symptom, and met with it only once in 107 cases. V. Török and Wittelshöfer[2] show that of 336 post-mortem examinations of women dead of mammary carcinoma, secondary deposits were found in 220, and of these the humerus was implicated in only 5, in 2 of which it had undergone fracture. Hence, neither clinical nor post-mortem evidence indicates that the observations of Snow are correct.

Cachexia.—With the progress of the local and general disease the so-called "cancerous cachexia" is established. This is nothing more than the general failing of the powers, such as is witnessed in many other maladies, attended with loss of blood, offensive and exhausting discharge, and suffering, and is due to the improper performance of the functions of the viscera, and the consequent ill effects produced upon the general nutrition, as indicated by wasting, loss of appetite and strength, nausea, sallowness, and a quick and feeble pulse. As we have just seen, death occurs, as demonstrated by post-mortem inspection, in an equal number of cases whether there be visceral deposits or not. The latter succumb from the intensity of the local disease and its effects; the former from the effects of metastases, as indicated by symptoms which denote implication principally of the lungs, pleura, liver, digestive organs, and nervous system.

Prognosis.—The foregoing facts, deduced from the morbid changes which ensue in carcinoma, clearly demonstrate that the prognosis of the affection is eminently unfavorable. This statement becomes the more apparent from the study of the cases which pursue a natural course and of those subjected to the knife. In this study are included the duration of life in each class and the influence of the operation on the progress of the disease.

Of 1527 cases, 137 ran a natural course, and 1390 underwent operation. Of the 137, 117 were dead, and of those in which the date was noted—

26.50	per cent.	died	in	between	5	and	12 months.
32.47	"	"	"		12	"	24 "
12.82	"	"	"		24	"	36 "
11.11	"	"	"		36	"	48 "
6.83	"	"	"		48	"	60 "
3.41	"	"	"		60	"	72 "
6.83	"	died after six years.					

The average duration of life was 28.6 months.

[1] *Lancet*, vol. i. 1880, p. 912.

[2] *Loc. cit.*, p. 883.

Of the 536 cases which perished after operation, with recurrence of the disease, and in 73 of which metastases were discovered, and were suspected in 56—

10.50	per cent.	died in between		6	and	12	months.
33.00	"	"	"	12	"	24	"
24.03	"	"	"	24	"	36	"
9.95	"	"	"	36	"	48	"
7.91	"	"	"	48	"	60	"
5.04	"	"	"	60	"	72	"
9.51	"	died after six years.					

The average duration of life in these 536 patients was 38.5 months; so that a comparison of the two tables shows that the course of the disease is retarded by the removal of the growth, and a comparison of the two averages indicates that operation adds ten months to the life of the patient.

Not only is life prolonged by operation, but the removal of the disease results in permanent recovery in 11.83 per cent. of all cases. As we have already seen, death from metastases occurs at 29.4 months, and the average date of death of those who succumb without or with operation is 33.5 months. We shall, moreover, see presently that local recurrence of the disease after three years is met with in only 2.30 per cent. of all cases. Hence, a radical cure may be assumed if the patient has survived the disease over three years without local or general recurrence after the last operation, or if she has died of some intercurrent malady under the same conditions.

Of 1234 cases submitted to the knife in which the histories could be followed, 134 were still living and 12 had died. Of these 146, recurrent growths were removed in 16, and there was freedom from disease after the last operation in—

45	for	between	3	years	and	1	month	and	3 years and 11 months.
25	"		4	"			"	4	" 11 "
22	"		5	"			"	5	" 11 "
18	"		6	"			"	6	" 11 "
9	"		7	"			"	7	" 10 "
7	"		8	"			"	8	" 9 "
4	"		9	"			"	9	" 10 "
4	"		10	"	and	1	month	" 10	" 10 "
3	"		11	"				" 11	" 9 "
4	"		12	"				" 12	" 3 "
3	"		13	"				" 13	" 8 "
1	for	14	"	and 7 months.					
1	"	15	"	" 7 "					

The average time of cure was five years and nine months, and the disease had existed before operation, on an average, for 13.3 months. The cases were not selected in order that the best possible results might be obtained, since I find that of 134 in which the nature of the opera-

tion is noted, the mamma was removed and the axilla was cleared out in 83, and the breast alone was amputated in 51, although in 3 of these enlarged glands were left intact in the axilla, and yet the cure was assured at the end, respectively, of five years and nine months, six years and one month, and ten years and ten months. It, however, appears that the percentage of cures is greater by 5.10 when the axilla is free than when the glands are infected, and that local reproduction does not militate against a final cure if the tumors be freely extirpated as soon as they appear. Of the 16 examples of repullulation, there was one recurrence in 12, two recurrences in 3, and three recurrences in 1. In these four cases the subjects were free from disease for three years and six months, three years and seven months, five years, and twelve years after the last operation. The practical deductions which can be gathered from such data are so clear that they do not require comment.

As a further proof of the influence exerted upon the duration of life by radical operations, attention may be called to the fact that nearly 30 per cent. were free from the disease after a lapse of six years; while of the 117 patients in whom no operation was practised, only 6.83 per cent. survived after that period.

Sir James Paget,[1] in speaking of the duration of life after operation, says: "I am not aware of a single clear instance of recovery—of such recovery, that is, as that the patient should live for more than ten years free from the disease." Applying this severe test, an examination of the table will show that 1 in $9\frac{1}{8}$ fulfils this condition.

In addition to the 146 permanent cures after operation, 134 cases were alive without recurrence from the last operation for a period which varied from three weeks to three years, or 18.5 months on an average, and 49 were dead without local reproduction, their mean life having been twenty months. Of these 183, 6 remained well for three years, so that they should really be regarded as cures.

If the patient survives an operation, local recurrence of the disease may be looked for. Of 1390 operations, 198 died from its immediate effects, thereby leaving 1192 cases for the consideration of the question of local reproduction. Of these cases, 156 are devoid of further history, having been lost sight of immediately after recovery; so that of 1036 patients—

329 were well, but 35 had had recurrences.
121 were alive with recurrence.
407 died with recurrence, but with no evidence of metastases.
56 " " " and with presumed metastases.
73 " " " " " actual metastases.
35 " " metastases, but without recurrence.
15 " " presumed metastases, but without recurrence.

[1] *Op. cit.*, p. 649.

It will thus be perceived that the tumor reproduced itself locally in 692, or 66.80 per cent., after 1036 operations—a fact which accords with the infiltrating nature of the disease as demonstrated by observations during life and during operative procedures.

In 478 cases in which the date was noted, the periods of recurrence were as follows:

							Within 15	days	in	43 cases.
							" 1	month	"	63 "
From the	end	of the	1st	to the	end	of the	3d	"	"	105 "
"	beginning	"	4th	"	"	"	6th	"	"	87 "
"	"	"	7th	"	"	"	9th	"	"	45 "
"	"	"	10th	"	"	"	12th	"	"	61 "
"	"	"	13th	"	"	"	18th	"	"	30 "
"	"	"	19th	"	"	"	24th	"	"	17 "
"	"	"	25th	"	"	"	30th	"	"	9 "
"	"	"	31st	"	"	"	36th	"	"	7 "
After three years									"	11 "

The table shows that 44.14 per cent. of the recurrences took place in three months, while after twelve months there were 74, or 15.5 per cent., and after three years there were only 11, or 2.32 per cent. The average period for all cases is 9.4 months. The cases of local reproduction within the first half year were doubtless examples of continuous growth, rather than of recurrence, and merely indicate that the original disease was not thoroughly removed. They, moreover, lead to the belief that, if recurrence does not ensue in that time, the chances for the patient are relatively good, and that the prognosis is all the more favorable as the period of freedom from signs of local contamination prolongs itself. The exceptional cases prove the rule that the patient is safe from reproduction after three years from the date of operation.

In 496 cases in which the point is noted the recurrent local disease was seated—

		Per cent.
In the cicatrix, remains of mamma, or vicinity, alone	in 294,	or 59.27
" " " " " and glands	" 117,	" 23.59
" glands alone	" 77,	" 15.52
" opposite breast	" 8,	" 1.61

Its locality, as influenced by the operation practised in 499 cases, was as follows:

1. Partial or total extirpation of the mamma without the glands, 96 cases:
   Recurrence in or near the cicatrix 46 cases, or 47.91 per cent.
   " " the glands alone . 19 " 19.79 "
   " " cicatrix and glands 31 " 32.29 "
2. Amputation of the breast with extirpation of the glands, 313 cases:
   Recurrence in or near the cicatrix 235 cases, or 75.08 per cent.
   " " the glands alone . . 38 " 12.14 "
   " " both places . . . . 40 " 12.77 "

In connection with this table there are two interesting practical facts. In the first place, where the breast and glands are removed the disease reproduces itself, on an average, in 6.4 months, while when the breast alone is extirpated recurrence follows in 7.7 months. Secondly, in the former operation the axillary glands are the seat of recurrence in 25 per cent. of all cases, while they are affected in 52 per cent. of the incomplete operations. Hence, the disease is more grave when the axilla is affected, but by clearing out that cavity in all operations we may naturally expect to diminish, if not prevent, further local dissemination and remove foci of general infection.

A review of the facts contained in the preceding pages in regard to the prognosis of carcinoma or the duration of life, as influenced by permitting the disease to pursue its course without surgical intervention or by endeavoring to stay it by a resort to the knife, leads us to adopt the following conclusions:

That when left to itself carcinoma inevitably kills, by its baneful consequences as a local disease or by its remote multiplication;

That about one in seven, or 14.24 per cent., of the patients die of the operation itself; but that the risk is not so great as to forbid interference, since it adds ten months to the life of the patient;

That operations of all kinds definitely cure 11.83 per cent. of all patients, or nearly as many as they destroy;

That the patient is safe from reproduction if three years have elapsed since the operation; and,

That, finally, recurrence may be delayed for several months, or be prevented altogether, by clearing out the axilla at the same time that the entire breast is removed.

Diagnosis.—The diagnosis of scirrhus of the breast in its early stages, or before there is implication of the surrounding tissues and the lymphatic glands, is based upon the age of the patient, the average being forty-eight years, the dimpling of the skin, the retraction of the nipple, the immobility of the solitary tumor in the mamma, or, if it be seated at the periphery, its intimate attachment, its nodular outline, its small size, its slow growth, and its stony hardness; and the diagnosis is strengthened if there were antecedent discharge from the nipple and malignant papillary dermatitis. When the disease has made some progress, or after the fifteenth month of its existence, the adhesion and invasion of the skin, the enlargement and induration of the associated lymphatic glands, the occurrence of ulceration and fixation to the chest, and the impaired nutrition of the patient, constitute a group of signs which can scarcely be mistaken.

Although scirrhous carcinoma is, as a rule, readily diagnosticated, it may be confounded with chronic abscess, gumma, and involution cysts. Thus, a 2-para at the age of thirty-four years was struck on the breast

by her husband. Shortly afterward she observed a hard lump in the upper and outer quadrant, which soon became the seat of sharp, lancinating pains. At the end of three months the swelling was as large as an orange, slightly attached to the skin, and apparently to the lower border of the pectoralis major muscle; the nipple was somewhat retracted, and two enlarged glands were felt in the axilla. After extirpation by one of my acquaintances, incision into the presumed carcinoma disclosed an abscess with thick walls. In a case recorded by Esmarch[1] a tumor as large as a fist, of four weeks' standing, neither tender nor fluctuating, but attended with infiltration of the surrounding tissues, retraction of the nipple, and enlargement of the axillary glands, was diagnosticated carcinoma. The tumor would have been extirpated had not the menses appeared, and it burst and discharged pus two days afterward.

In November, 1883, a married woman, aged twenty-eight years, presented herself at my clinic on account of a hard tumor, of four months' duration, seated beneath the areola and to the outer side of the nipple. The skin was seamed, infiltrated, and adherent, the nipple was drawn toward the growth, and the axillary glands were swollen. Careful inquiry elicited a history of syphilis, an abortion at three months, and one at three years, after marriage. Under mixed treatment the tumor promptly disappeared.

Involution cysts have not unfrequently been mistaken for scirrhus, and I, myself, on one occasion removed a cystic breast under the supposition that it was an example of hard carcinoma. In any case of doubtful diagnosis the tumor should, therefore, be cut into before the breast is sacrificed.

From this general course of carcinoma there are certain deviations which may be ascribed to histological peculiarities, since the following study of medullary, colloid, and atrophying cancer shows that the intensity of the disease is modified by structural aberrations. All of these varieties possess certain features in common, but the different degrees of malignity are sufficiently pronounced to warrant a separate examination of their individual characteristics.

Medullary Carcinoma.—Medullary, or tuberous, carcinoma, as it is denominated by Birkett and Bryant, is described by most authors as being enclosed in a distinct capsule; and they distinguish it from ordinary cancer by its occurrence at a comparatively early age, by its more rapid growth and larger volume, by its soft consistence, by the marked enlargement of the subcutaneous veins, by the natural state of the nipple, by the rare and late adhesions and contamination of the lymphatic glands, by the frequent formation of ulcers which protrude bleeding masses beyond the surrounding level, and by its very rapid course.

[1] *Langenbeck's Archiv*, Bd. xxi. p. 627.

While it is true that some of these statements are correct, it is very evident that the life-history of medullary carcinoma is lost in that of medullary sarcoma. Medullary carcinoma is never encapsuled, and the presence of a limiting envelope is, of itself, sufficient to decide against it. The following account of its general pathology is based upon a study of 38 cases derived from various sources, and including 3 of my own:

It occurs as early as twenty-nine and as late as sixty-nine years, the average being 46.8. 35 per cent. of all cases are met with before forty, and 65 per cent. after that age, while 35.29 per cent. occur after fifty.

Medullary carcinoma grows rapidly, and the volume of a child's head in three, five, six, or eight months, or even in five, six, or eight weeks, is not uncommon; but it never attains the bulk which is sometimes witnessed in sarcoma. Its consistence is soft and elastic, or even fluctuating, so that it may be mistaken for an abscess in two-thirds of all cases. In the remaining third the tumor is hard or firm, with a certain degree of elasticity. Like sarcoma, but unlike ordinary cancer, its outline tends to lobulation.

The subcutaneous veins are prominent in 7.89 per cent. of all cases, and the nipple is retracted in 33.33 per cent.

The lymphatic glands are infected in 71.05 per cent. and their taint may show itself as early as three weeks or be delayed for nearly five years.

The skin is discolored and adherent in 33.04 per cent., and it also contains distinct nodules in 5.88 per cent. of these cases. Ulceration is met with in 18.42 per cent., and the sore is deep and excavated and liable to hemorrhage, but it does not fungate.

The tumor is fixed to the chest in 29.41 per cent. of all instances, and in 9.83 per cent. of these circumscribed tubers exist in the pectoral muscles. Both breasts are affected in 5.26 per cent. of all cases.

Of the five cases that ran a natural course, all were dead, on an average, in fourteen months from the first appearance of the disease, the period having been, respectively, five weeks, six weeks, five months, two years, and three years and a half. Post-mortem inspection in two cases disclosed metastatic tumors in the lung and pleura in one, and in the thyroid gland, pericardium, liver, omentum, and kidney in the other.

Of 33 subjected to the knife, further details are wanting in 6, but their average life, up to the date of interference, was twenty months. 6 died from the operation itself. The mean life was twenty-seven months, and the only post-mortem examination that was made showed deposits in the liver and pleura. One patient expired from an unknown cause in twenty-eight months.

Of ten subjects who died with local recurrence after operation, the average life was sixteen months and a half, and the tumor reproduced itself in three months on an average. In the single post-mortem section the liver, stomach, and ovary were found to be occupied by secondary growths. In one case death was due to metastases, but there was no recurrence, while in another case the patient was alive with local return.

Two died of an intercurrent affection, without recurrence, at the end, respectively, of eighteen months and nine years and ten months, their total life having averaged eight years and three months. Six were alive and well, respectively, for sixteen months, nineteen months, twenty-four months, four years, four years and ten months, and five years and six months after operation, and their mean life from the first observation of the disease was three years and a half. In all of these cases, with one exception, infected glands were also removed.

From the foregoing account it follows that, after the atrophying form, medullary carcinoma is the most malignant of all the tumors of the mamma, since the glands are infected in 71 per cent.; local recurrence ensues within three months after removal in 55 per cent. of all cases; metastatic growths are always discovered on post-mortem inspection, and are preceded by taint of the glands of the axilla in three-fourths of the instances; and the total duration of life without surgical intervention is only fourteen months, or one year and a half shorter than that of any of the other varieties of carcinoma. Life may be prolonged, however, and a positive cure result in 20 per cent. of all cases, by an early resort to the knife, even if the axillary glands are extensively contaminated.

The distinction between medullary carcinoma and medullary sarcoma may be made by paying attention to the following points: A soft, rapidly-growing tumor, occurring before the twenty-ninth year, warrants the exclusion of carcinoma. No matter at what period of life the tumor may develop, a discharge from the nipple, freedom from retraction of that body, infection of the glands, invasion of the skin, and fixation to the chest almost conclusively point to sarcoma; and if the tumor be the seat of a fungating ulcer, the diagnosis is confirmed if the protruding mass be not attached to the surrounding skin.

Colloid Carcinoma, as based upon a critical analysis of 22 cases, is distinguished by its chronic course, by its less frequent local dissemination and infection of the glands, and by the protracted appearance of metastatic deposits, features which make it the least malignant of the cancers. Its comparative immunity from local and general dissemination may be ascribed to the biological changes in its cells, the greater portion of the protoplasm of which is converted into colloid material, which acts the part of an intercellular substance and prevents

or retards the migration of the cells into the adjacent tissues and their transference along the lymphatics to the associated glands and the viscera.

It is met with as early as twenty-seven and as late as sixty-six years, the average being forty-seven; 81.82 per cent. occur after the fortieth year, and 50 per cent. after the age of fifty.

It increases very slowly, and the volume of a fist is exceptional, that of a hen's egg being the rule, and it may require fourteen years to attain that size.

Its consistence is hard, only 4.54 per cent. being soft and elastic, and then only at the more prominent bosses. Its outline is nodular.

The subcutaneous veins are somewhat prominent in 13.63 per cent. The nipple is retracted in 30.72 per cent., and discharges a bloody fluid in 9.09 per cent. The glands are infected in 54.54 per cent. The skin is adherent in 22.72 per cent., and it also contains distinct nodules in 13.63 per cent. Ulceration is met with in 13.63 per cent. The tumor is fixed to the chest and the pectoral muscles are pervaded by tubers in 13.63 per cent., and both breasts are involved in 9.09 per cent. Pain is experienced in 36.36 per cent.

Of the 3 cases that ran a natural course, 2 died at the end of twelve years, and 1 in eleven years, from the first observation of the disease. In all the glands were involved. In 2 the entire skin of the chest was pervaded by nodules, thereby constituting cancer en cuirasse, and secondary deposits were found in all.

In 2 death resulted from the operation. In 1 there was no section, but the disease had existed for ten years, while in the second, of twelve years' standing, metastases were present.

In 6 there is no further history after operation, but the tumor had existed, on an average, for twenty-eight months; 1 patient died without recurrence from an unknown cause seventeen months after operation.

In 2 cases the patients were alive with recurrence, the total life having averaged thirteen years and six months; 3 subjects were dead with recurrence, and their average life was twenty-six months. In the former the glands were not infected, while they were invaded in the latter.

In 5 cases the patients were still alive and free from recurrence; in 3, respectively, for nineteen, twenty, and twenty-four months, and the disease had existed, on an average, for six months before operation; and in 2 there was no recurrence in three years and in five years and ten months, and the disease had existed, on an average, for nine months before surgical intervention. Hence these patients may be regarded as cured. In this class of cases in only 1 were the axillary glands invaded, and the subject was well at the end of two years.

From these facts it will be seen that one-half of the cases recur after operation, and that, although the disease requires eleven years and eight months to run its course when uninterrupted by operation, it is impossible to calculate what effect operation has on prolonging life. The most that can be said is that in the cases in which the history is complete the patients were still living upward of forty months after operation, and that the disease had existed previous to operation thirty-two months, and that 15.38 per cent. of the subjects are cured by surgical intervention.

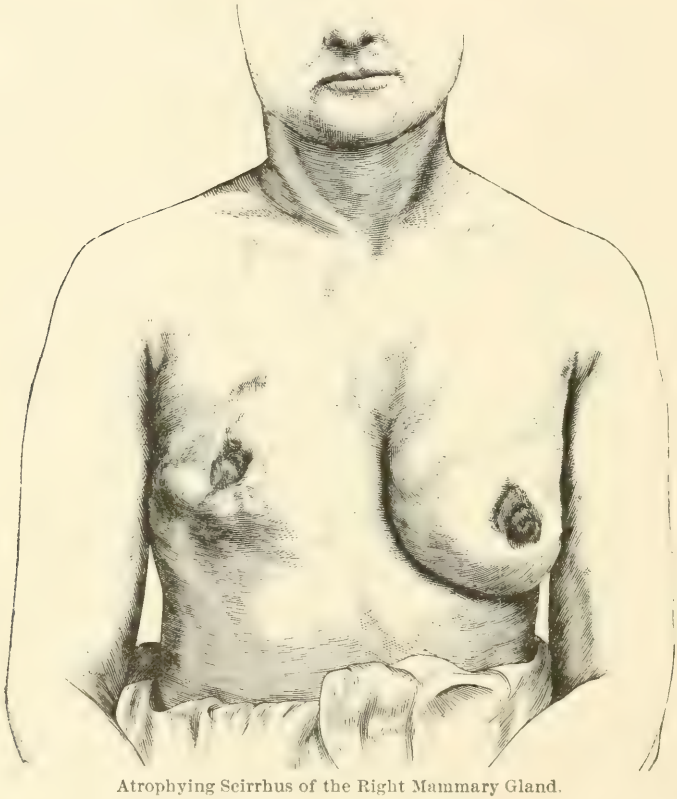
Atrophying Scirrhus.—Withering, or atrophying, scirrhus is usually stated to pursue a milder course than the other forms of carcinoma as regards glandular and visceral participation; and this assumed attribute is said to arise from its tendency to result in a natural cure. While it is certainly true that the older portions of the tumor do undergo cicatricial contraction and atrophy, it is none the less true that, so far from nature effecting a cure, the surrounding tissues are simultaneously being invaded to a far greater extent than is met with in any other variety of cancer, although infection of the glands is not so common. In point of fact, withering scirrhus evinces signs of local and general extension to so wonderful a degree that recurrence after operation is met with in seven-tenths of all cases, and post-mortem inspection has never failed to disclose visceral deposits. The recurrent disease is, moreover, more intense than in any other cancer, taking place in three-fourths of all instances during or soon after cicatrization, and showing itself in the glands and as tubers in the skin, subcutaneous connective tissue, and pectoral muscles. In one case, indeed, the entire course of the disease was only seven months, and two operations for recurrence, the second having been a most extensive one, were practised. In one case of death from operation secondary deposits were found in the liver, and the disease had existed only five months in a woman of fifty-five years. In still another example, in which the disease developed at the forty-fourth year, on death without operation in one year metastases were found in the lungs, pleura, and liver. From a study of forty-five cases, which include ten of my own, I can find nothing to confirm the idea that the course of the disease is more rapid when it develops early than late in life.

Although patients may live many years, even for thirty years, they none the less surely die from its effects, and the longer it lasts the more liable are the adjacent tissues, glands, and the viscera to extensive infection. Thus, I have recorded a case,[1] the structural features of which are represented in Fig. 44, in which the tumor first showed itself at the age of forty-six years, and on death, seventeen years later, the skin of the corresponding mammary and scapular regions and of the oppo-

[1] *Philadelphia Medical Times*, vol. viii. p. 84.

site breast, and at the base of the xiphoid cartilage, was pervaded by lenticular nodules; the axillary portions of the pectoral muscles were converted into densely hard masses; the glands of the corresponding axilla and supraclavicular fossa and of the left axilla were enlarged and indurated; and both lungs, the pleura, the bronchial and mediastinal glands, and left half of the diaphragm, and one kidney, were beset with metastatic deposits. In a second case, the external features of which are shown in Fig. 56, and the minute appearances of which

FIG. 56.



Atrophying Scirrhus of the Right Mammary Gland.

are depicted in Figs. 41 and 45, I removed, on account of excessive suffering, a tumor of fourteen years' duration, which had commenced at the age of thirty-one. Not only was the pectoral fascia itself infiltrated, but the subjacent muscle was so extensively occupied by nodules as to demand the removal of its larger portion. The axillary glands formed a densely hard tumor which extended up under the clavicle, and, as it was intimately attached to the axillary vessels and nerves, I was obliged to leave a portion in the wound.

Withering scirrhus occurs as early as twenty-nine and as late as

sixty-five years, the average being forty-nine, or somewhat later than the other varieties of carcinoma. 14.28 per cent. develop before the fortieth year, and 85.72 per cent. after that age, of which more than one-half occur after the age of fifty.

Its consistence is densely hard, its volume is exceedingly small, and its outline is nodular, knotty, and irregular.

The subcutaneous veins are never enlarged, but the nipple is always retracted.

The lymphatic glands are infected in 56.81 per cent. of all cases; the skin is adherent in 45.45 per cent., contains nodules in 11.36 per cent., and is ulcerated in 34.09 per cent. of all instances.

The tumor is fixed to the pectoral fascia, and in the majority of cases closely, in 39.29 per cent., and nodules are disseminated in the pectoral muscles in 29.77 per cent. of all cases. The opposite breast is invaded in 1 case out of every 22½.

Of 12 cases that pursued a natural course, 4 were living, their average life having been fourteen years and nine months; 4 were dead, their average life having been six years and ten months, and in 4 there was no further history, their average life having been thirty-seven months. In 2 of these cases post-mortem examinations were made, and they disclosed metastases in the lungs, pleura, and liver in 1, and in various organs, as I have indicated above, in a case of my own.

Of 33 cases that underwent operation, 2 died of its consequences. In 1 the total duration of the disease was five months, and secondary tumors were found in the liver. 10 died with recurrence, 2 of recurrence and metastases, and 1 of presumed metastases, and their average life was ninety-three months; 5 were still living with recurrence, forty-two months having elapsed, on an average, since the first observation of the disease, and 1 recurred, but further details are wanting. 5 remained well, 1 for seven years, 1 for five years, and 1 for three years and eleven months, or for eighty-four months, on an average, from the first detection of the disease, while 2 were well for twenty months each, their mean life having been thirty months and a half. In 2 of these subjects the skin and axillary glands were infected. In 7 cases the history ceases with recovery from the operation.

Hence, in the cases in which the histories are complete the disease recurred in 70.83 per cent., and metastatic tumors were found in the 5 cases in which the body was opened after death. In point of malignity, therefore, although its course is essentially chronic, atrophying scirrhus is the most pernicious of the tumors of the breast, although operations cure 11.53 per cent. of all cases.

Treatment.—From the great frequency of mammary carcinoma, and its inevitably fatal termination if it be permitted to pursue a natural course,

there is no subject within the entire domain of surgery of more importance than that of its treatment. In discussing this question we fancy that it will not be denied that the management should be based solely upon principles deduced from a careful study of pathological facts and the results of surgical intervention, and not upon the old theory of the constitutional nature of the disease. Carcinoma is now held to be primarily a local growth by all leading pathologists, with the probably solitary but conspicuous exception of Sir James Paget, and the day has passed for the physician to declare that a tumor was not a cancer because it did not recur after removal. These truths cannot be too forcibly or too frequently impressed upon the laity and the family attendant; and the sooner women learn that the disease can be cured by early and adequate operation, the better it will be for their sex and the greater will be the credit accruing to our art.

In our study of the clinical course pursued by the affection it has been pointed out that, with its advance, its malignant attributes manifest themselves, first, by local or regional dissemination; secondly, by infection of the associated lymphatic glands; and, thirdly, by the development of secondary growths or deposits in the various tissues and organs. Hence, our aim should be to prevent these disastrous occurrences by a resort to the knife, which is the only measure upon which reliance can be placed.

That surgical intervention does prevent, to a certain extent, the invasion of the paramammary fat and connective tissue, skin, and subjacent muscles of the chest is shown by the following facts: Observation during life and during operations indicates that the contiguous structures are infected in 82.95 per cent. of all instances, while of 1036 operations there was local reproduction in 692, or 66.80 per cent. Hence, extirpation precludes continuous invasion of the surrounding tissues in 16.15 per cent. of all cases.

The influence of operations upon the prevention of gland infection is most decided. Thus, of 1638 cases, the glands were palpable in 1115, or 68.07 per cent., when the patient first came under observation, while of 496 operations in which this point is noted, the recurrent disease was seated in the glands in 194, or 39.11 per cent., or in 28.96 per cent. less than when the affection was not interfered with. It is, moreover, noteworthy that glandular recurrence was more frequent by 27 per cent. when the breast alone was removed than when it was extirpated along with the contents of the axilla.

Not less striking is the influence of operations upon the obviation of secondary visceral growths. Thus, of 256 patients dead of carcinoma in whom the disease pursued a natural course, metastatic tumors were discovered in 158, or 61.71 per cent. Of 838 dead after operation, on the other hand, secondary deposits were found in 286, or 34.12 per cent.,

so that operations prevent implication of the internal organs in 27.59 cases out of every 100.

Having thus seen that the removal of the breast frustrates to a great extent regional, glandular, and general infection, it is not surprising that operations should, as has been already pointed out, not only prolong life by ten months, but, in addition, bring about a cure in nearly 12 per cent. of all cases, in six-tenths of which the glands were implicated, and in one-ninth of which the recovery was permanent after extirpation of recurrent growths. When, in addition to these complications, it is considered that in these cases the disease had already existed, on an average, for 13.3 months, and that seven-tenths of the operations must be regarded as having been inadequate to remove all the affected tissues, the success is remarkable, and justifies the inference that early and thorough operations will greatly increase the ratio of cures. In point of fact, the results of free excision of the breast, along with extirpation of the axillary contents, in every case indicates that the cures may be nearly doubled. Thus, of 115 cases in which the result was ascertained from the practice of Mitchell Banks and myself, 24, or 20.86 per cent., were permanently successful. If these be deducted from the remainder, the latter yield only 10.99 per cent. of cures, thereby showing the great advantage of attacking the axilla in all cases.

The rule to remove the axillary contents in every case should be absolute. In not a few instances infected glands cannot be detected prior to operation, but none the less must the rule be observed. The vast importance of attending to this step of the procedure is shown by the following facts: In 16 of my own cases the glands could not be felt from without, but in 14 of these they were present when the axillary space was explored. Hence, my experience indicates that the glands may be expected to be implicated in 87.5 per cent. of all cases in which they are not palpable through the coverings of the axilla. In Kuester's[1] practice the proportion of glandular involvement under similar circumstances was somewhat larger, as his last 65 cases indicate infection in 57, or 92 per cent.

The results that I have indicated have not been obtained without a considerable mortality, since of the 1390 operations, 198, or 14.24 per cent., were fatal from the immediate effects of the procedure. The reason for this high rate of death is to be found in the defective manner in which the axillary wound was managed in a large proportion of cases in preantiseptic days, through which hemorrhage, erysipelas, septicæmia, and pyæmia were common occurrences. Banks, one of the latest writers on the subject, lost 10 out of 82 cases, in which the breast and axillary glands were extirpated, from septic surroundings. My own 43 operations, which were done up to May, 1887, and

[1] *Deutsche Zeitschrift für Chirurgie*, Bd. xxxvi. p. 143.

which were more extensive than those of Banks, afford 2 deaths—1 from fat embolism and 1 from pneumonia; and of 10 additional cases in the hands of my colleagues in the Jefferson Medical College Hospital, all recovered. Hence, my mode of operating, which will be described presently, has yielded a mortality of only 3.7 per cent. Billroth's operations for the removal of the breast and glands in pre-antiseptic days were attended with a death-rate of 21.3 per cent., while the mortality under antiseptic precautions was only 10.5 per cent.;[1] and there is every reason for believing that the future mortality of radical procedures will not exceed 6 or 7 per cent., provided the operation is strictly aseptic. Kuester's[2] last 96 cases, indeed, were attended with only 5 deaths, or a fatality of only 5.2 per cent. Even if the mortality should remain at 14.24 per cent., operations should be considered perfectly justifiable, since in destroying that number it is to be remembered that they cure 12 women out of every 100. This statement applies to all sorts of operations; but the proportion of cures to deaths becomes the more striking if we consider those cases only in which thorough operations were practised. Thus, of 257 examples of extirpation of the breast and axillary contents from the practice of Banks, Kuester, and myself, 12.06 per cent. perished and 19.38 per cent. were cured.

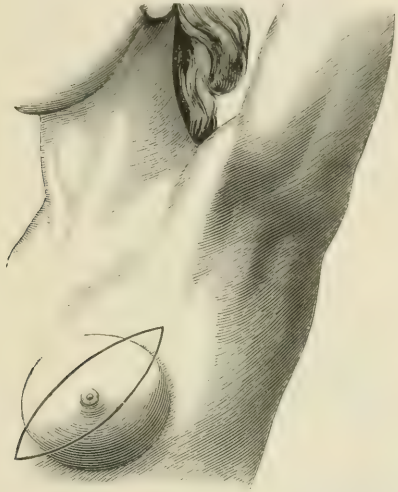
In no operation for malignant growths is the requirement to go far beyond the apparent limits of the disease so urgently demanded. This is shown not only by the pathological facts as to regional dissemination and the common recurrences after operation, but also by the anatomy of the healthy gland. The normal limits of the breast are very uncertain. Small, scarcely perceptible lobules frequently lie at some distance from the main body of the gland, particularly in the axilla and just below the clavicle. In one case I found an affected portion near the shoulder, and it would not have been discovered in the ordinary methods of operating. It is for these reasons, as well as on account of the want of success that attended my earlier partial and incomplete operations, and the fact that the experience of centuries has demonstrated that recurrence takes place in the tissues that are left behind in the old operation, that for nine years I have amputated the entire breast with its coverings, and invariably cleared out the axilla. In the old operation, shown in Fig. 243, the nipple and a portion of the skin are included in two oval incisions, the flaps are raised, the mamma is then rapidly dissected or torn from the pectoral fascia, the vessels are secured, a drainage tube is inserted, and the edges of the wound are united with sutures. The surgeon congratulates himself upon having done a neat bit of work, and the patient is pleased with the rapidity of her recovery. But beneath the flaps so neatly apposed are hidden the germs of

[1] *Op. cit.*, p. 155.

[2] *Deutsche Zeitschrift für Chirurgie*, Bd. xxvi. p. 147.

recurrence in the fat and pectoral fascia that remain behind, and in the lobules, which I have more than once seen operators overlook. In these cases axillary glands were also removed if they were felt prior to operation; but the surgeon was unmindful of the fact that many glands

Fig. 57.



The Ordinary Method of Removing a Carcinomatous Breast.

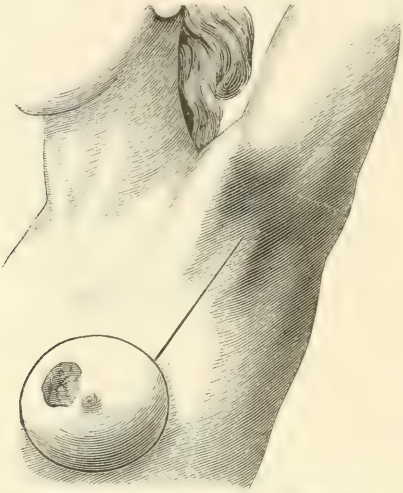
might be buried in the axillary fat, where they could have been detected if the incision had been prolonged and the finger had even carelessly searched for them. Such is the ordinary procedure of ridding a woman of so formidable a disease; such is the operation which has cast an opprobrium on surgery from which it will take many years to recover; such is the operation which we have to thank for the large percentage of recurrences, for the fatal progress of the disease, for the great injustice done our patients, and for the harmful impression made upon the laity, and not a few of the profession, as to the inutility of interference.

In exceptional cases, as when the patient's life is threatened by repeated bleeding, by exhausting and offensive discharges, and by great suffering, the partial operation is eminently proper to afford temporary relief. If the aim, however, be to effect permanent riddance, the knife must be employed with no sparing hand; all tissues, namely, the skin, paramammary fat, the entire gland, pectoral fascia, and axillary contents, which long and accumulated experience has demonstrated to afford the seats of recurrence, must be freely extirpated.

With this object in view, even in the most favorable of all cases, or one in which the tumor is of moderate volume, no matter what its situation may be, and devoid of superficial and deep attachments, and the glands cannot be felt before operation, the procedure to which I have

resorted in 43 cases, and which is delineated in Fig. 58, may be thus outlined, strict aseptic precautions being observed throughout.

Fig. 58.



The Method of Operating for Carcinoma of the Breast, as practised by myself.

The entire mammary region having been carefully palpated while the patient is supine, in order to discover any outlying lobules should they exist, a line is drawn with an aniline pencil around the entire circumference of the breast as a guide for the knife. If the tumor be peripheral, the incision must extend for at least one inch beyond its apparent limit. A stout large knife is then carried along the line down to the pectoral muscle, spirting vessels are temporarily controlled with the fingers of the assistant, or with clips, or forcipressure forceps, and the breast is removed along with the pectoral fascia, through which the muscle is exposed as if for class-room demonstration. The vessels having been permanently secured with catgut ligatures, the fat around the line of the incision is carefully explored for any outlying nodules of disease, a precaution the observance of which will be made apparent when I state that in three of my cases they were found, thereby showing to what extent the disease may disseminate itself even in apparently simple cases. Any remaining nodules having been removed, the pectoral muscle is now carefully examined with the eye and fingers for nodules. If present they should be freely removed and the wound seared with Paquelin's cautery. The large exposed surface having been protected with an aspepticized towel, the arm is carried outward and upward to rather more than a right angle with the trunk, and an incision is prolonged into the axilla about three-quarters of an inch below the lower border of the great pectoral muscle, through which the deep fascia is opened to the same extent as the cutaneous wound.

If there happen to be a number of small glands or two or three large ones, and they are not united to the surrounding tissues, their removal, along with the entire fatty contents of the axilla, can easily be effected with the fingers and scissors. When, however, as more frequently happens, the glands and other axillary contents are converted into an inseparable mass, they will have to be dissected out with the knife and scissors curved on the flat. In performing this step of the operation the lower portion of the mass and that which adheres to the side of the chest and pectoralis minor, and surrounds the intercosto-humeral nerve and other superficial nerves, should first be separated, and we should carefully work our way up to the apex of the space, including every vessel, arterial or venous, between the two ligatures before dividing it. Unless this precaution be observed, large venous trunks are liable to be cut or lacerated close to their points of entrance into the axillary vein, an accident which will be followed by troublesome hemorrhage. The most difficult part of the operation is the separation of the glands from the axillary vein as it lies under the pectoral muscle. In many cases this can be effected with the finger-nails, the arm having been brought toward the trunk; but when they are firmly incorporated with the vein, provided the adhesion exists to a limited extent, the corresponding portion of the vessel should be removed between two ligatures. Glands which are attached to the vein immediately beneath the clavicle are best reached by carrying an incision in the interval between the sternal and clavicular origins of the pectoralis major muscle, as in the operation for ligation of the first portion of the axillary artery. Such a procedure will do away with the necessity for division of the pectoralis muscle, which is recommended by Verneuil.[1] When the glandular involvement is very extensive, to afford more room Esmarch[2] favors amputation at the shoulder-joint, but such an extreme measure is, in my opinion, useless, as it will be found that all diseased tissues cannot be removed. Finally, the mass is brought down and the dissection continued until it is separated from the posterior boundary of the axilla, great caution being exercised lest the subscapular artery, vein, and nerves be injured, thereby avoiding hemorrhage and impairment of the movements of the arm. Should the axillary vein be wounded, if the injury be slight, hemorrhage may be arrested by including the opening in the grasp of forcipressure forceps, which, as I know from experience, need not be retained longer than two days; should the injury, however, be extensive, a ligature should be cast around the vessel on each side of the opening.

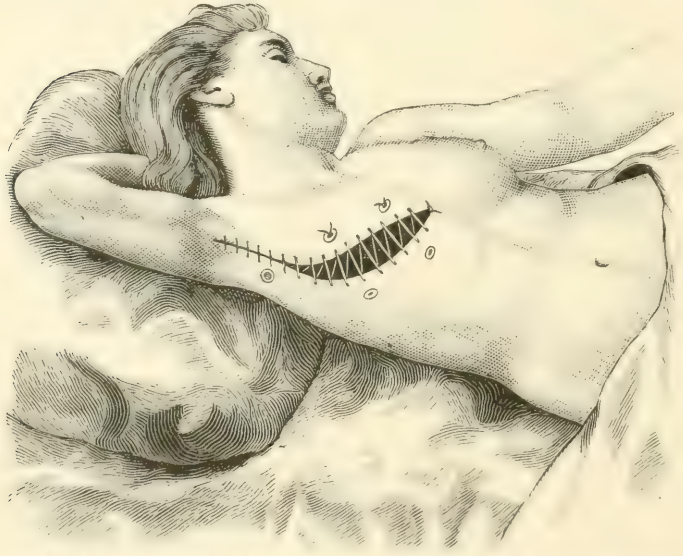
The parts are now thoroughly irrigated with the 1 : 1000 solution of corrosive sublimate, and the edges of the wounds are brought as

[1] *Gazette des Hôpitaux*, 1879, p. 955.

[2] *Deutsche med. Wochenschrift*, No. 17, 1883, p. 258.

thoroughly as possible into apposition. If the breast flaps be raised from the subjacent parts for an inch and a half or two inches, one will be astonished to find how nearly the wound may be closed in corpulent women with large breasts, in whom before approximation the exposed surface was as large as a dessert plate, and how accurately the wound can be united in thin women with small breasts. In the former class of patients I first insert two or three of Macewen's button sutures at the bases of the flaps, and then approximate the free edges with the continued suture. In this way the edges of the largest wounds may be brought so nearly together that a space not exceeding two fingers' breadths in width will have to unite by the process of granulation. A hole having been punched through the most dependent portion of the posterior axillary flap, into which a glass drainage tube is inserted, the edges of the axillary wound are coaptated by the continued suture, the material for the suture being heavy sublimate silk. These points are shown in Fig. 59, but the edges of the breast wound are repre-

FIG. 59.



Mode of Approximating the Edges when the Wound cannot be Entirely Closed.

sented too far apart. When it is possible to bring together the edges of the wound, a drainage tube is employed; otherwise it is not required. Before applying the outer dressings, a description of which is unnecessary, both wounds are again thoroughly washed out with the corrosive solution. The drainage tube is removed at the end of twenty-four hours, and the stitches are taken away on the eighth day. If the wound has been a partially open one, moist antiseptic gauze is

continued until it has fully cicatrized, which requires from four to six weeks.

When, as usually happens, it is possible to bring the edges of the wound in apposition, it is closed with the continuous chromicized catgut suture, and painted over with iodoform collodion. At the expiration of eight or ten days, when the crust will have become detached, the union will be found to be perfect.

Such is the radical operation which I have practised for some years, so radical, indeed, that I fear that, for the present, it will not gain many adherents. Thus, in a discussion on immediate reunion in amputation of the breast, at the Société de Chirurgie,[1] 1885, Lucas-Championnière, Polaillon, Marc Sée, Tillaux, and Trélat declared against free removal of the skin, and Polaillon even went so far as to assert that it did not influence recurrence. Verneuil and Després, on the other hand, were in favor of removing the skin largely, and leaving a partially open wound, through which, the drainage being excellent, erysipelas and other wound complications were prevented. In the remarks on Banks' paper at the Harveian Society,[2] in the spring of 1887, in which that surgeon reported 82 cases of extirpation of the breast along with the axillary contents, Bryant and Butlin questioned whether the complete operation afforded better results than the incomplete, and Butlin,[3] Pick, and Cripps held that clearing out the axilla in every case was neither necessary nor judicious, although Pick asserted that the skin should be freely removed. Owen was the only member who gave cordial support to the procedure urged by Banks, the prevailing opinion being that the operation was attended with an excessive mortality and did not lessen the risk of recurrence.

The preceding views enunciated by practical surgeons are entirely theoretical. Let us turn from surmise to an analysis of facts. I have already stated that the mortality of my operation, which is more extensive than that of Banks, and of which nearly one-third were not aseptic, is only 3.7 per cent., although in addition to the removal of the entire breast with its coverings and evacuating the contents of the axilla, large portions of the pectoral muscle were excised in 1 case out of every 7. It has already been pointed out that of 313 amputa-

[1] *Gazette des Hôpitaux*, Nos. 4 and 7, 1885.

[2] *British Medical Journal*, March 12, 1887, p. 572.

[3] In his recent work on *The Operative Surgery of Malignant Growths*, Butlin enters fully into the question of clearing out the axillary contents, and asserts that the axilla should on no account be interfered with unless the glands are obviously enlarged. Had so good a pathologist as Butlin been in possession of the facts derived from my practice and that of Kuester, he would scarcely have given utterance to so pernicious a doctrine, a doctrine which we fear will so influence English surgeons as to counteract in great measure the recent advances that have been made in the treatment of carcinoma of the breast.

tions of the breast as ordinarily practised, combined with extirpation of the glands, the recurrent growth was seated in or near the cicatrice in 235, in the glands in 38, and in both situations in 40; in other words, recurrence was met with in the remains of the breast tissues in 275, or 87.86 per cent. Included in these figures are my own cases. If these be deducted, amputation of the breast as usually done, with clearing out the axilla, demonstrates that in 94.47 per cent. the disease recurred in or near the cicatrice, while my cases show only 30.55 per cent. of recurrences in that locality, the percentage of immunity from local reproduction being in favor of my procedure by 63.92 per cent. In addition to these advantages, I have obtained 21.05 per cent. of cures.[1] These are facts, not mere expressions of opinion; and until some other operation is brought forward that will show a still further diminished mortality, a smaller proportion of recurrences, and a greater number of permanent recoveries, I contend that the procedure that I practise is the most successful and most rational that has as yet been devised.

Although my mode of operating has afforded better results than that practised by any other surgeon, a study of the cases of Banks, whom I have seen operate, and who does not remove as much of the skin as I do, shows that he met with 32.83 per cent. of recurrences and obtained 20.85 per cent. of cures, so that his results are nearly as good as my own. On this account I felt as if I had possibly sacrificed too much of the integument; and I have in four recent cases so far modified my operation, the skin in none being apparently affected, as to save a sufficient amount of that structure to admit of bringing the wound nicely together without tension. These four cases can be followed, and whenever I feel assured that I will be able to trace my patients I intend giving this procedure a fair trial. When, however, the subject lives at a great distance or is too poor to return in the event of recurrence of the disease, I will adhere to the more sweeping procedure.

When the contents of the axilla form a large, hard, nodular tumor,

[1] Of my 43 operations, 2 were fatal; 5 patients were lost sight of after recovery; the disease recurred in 16; and 20 subjects remain well or perished from other affections without recurrence. Of this last class, 8 were cured; so that of 38 cases in which the history could be traced, 8, or 21.05 per cent., were examples of permanent recovery. Of these, 1 lived for seven years and ten months, while the remainder are still doing well, 1 for eight years and seven months, 1 for eight years and six months, 2 for six years and three months, 1 for three years and nine months, 1 for three years and five months, and 1 for three years and one month after operation. The next best results have been attained by Banks, Estlander, and Kuester, who cured, respectively, 20.85, 20, and 17.85 per cent. of their cases. Other surgeons who have recorded a higher rate of cures do not include the fatal cases in their calculations, but base their rate on the number of patients who have recovered from the operation. Such an estimate is manifestly incorrect.

and the disease has existed for some time, before amputating the mamma I make it a rule to attack the axilla first, since in many of these cases it will be impossible to remove the entire disease even if the surgeon were to excise the vessels and the axillary plexus of nerves to which the mass adheres. If all diseased tissues cannot be extirpated, nothing further is done. In such cases excision of the breast prior to attempts to extirpate the axillary mass involves an unnecessary operation. Should the supraclavicular glands be invaded, I always cut down upon them first and remove them, if they be superficial. Should they be deep and surround the large vessels and nerves, attempts at their removal would be not only dangerous, but useless.

In atrophying scirrhus of several years' duration; in any variety of carcinoma in which the attachments involve the entire mammary region; when nodules are extensively disseminated over the surface of the chest; in the cuirass form of carcinoma; when immobility of the arm, œdema, and pain indicate that the vessels and nerves of the axilla are intimately connected with the mass; and when there are indications of visceral implication,—the disease has advanced so far that radical operations are unjustifiable. Implication of both breasts is not a contraindication.

In cases unfit for operation life must be rendered endurable by the relief of pain, the arrest of hemorrhage, and the correction of fetor. If the suffering be great, it may be allayed by the hypodermatic injection of morphia and atropia, repeated as often as may be required. When the pain is increased by the rapid growth of the neoplasm, during which the breast is hot, tense, and tender, nothing mitigates it so rapidly as the local application of a strong solution of acetate of lead, or of bags of ice. When the active symptoms have subsided these measures may give way to the application of an ointment composed of a drachm each of extract of belladonna and extract of stramonium to the ounce of lanolin. Œdema of the arm should be met by massage, elevation, and a flannel roller. Hemorrhage may be controlled by styptic cotton, although excision of the breast may be required if it recurs and threatens life. As a deodorizer, I have found that a 1 per cent. solution of chloral hydrate, or a 3 per cent. solution of citric acid, both of which remedies also possess the merit of assuaging pain, answers a better purpose than the germicidal antiseptics. Should the tumor be sloughing, it should be freely sprinkled with iodoform and dressed with sublimate gauze.

With regard to general measures, it need only be stated that the diet should be nutritious and assimilable, and that the strength should be supported by alcohol and appropriate tonics.

Cysts.

A cyst may be defined to be a fibrous sac filled with more or less fluid contents, which is formed independently of the neoplasms of the mamma. Hence, the cysts under consideration must be carefully distinguished from the softening and extravasation cysts which are of not infrequent occurrence in the neoplasms properly so called, and from the retention cysts which are so commonly found in connection with fibroma, sarcoma, myxoma, and adenoma. The former constitute cystoid, and the latter cystic, tumors.

The ordinary clinical classification of cysts is entirely artificial and affords no clue to their derivation, as it is based upon the nature of their contents. In accordance with their mode of origin cysts may be classified, first, as glandular or epithelial, which result from the accumulation of the secretion and dilatation of the acini and ducts, and which are known as mucous or retention cysts; secondly, as connective tissue, endothelial or lymphatic, which arise by the expansion and fusion of the interfibrillar lymph spaces of the periglandular connective tissue, and which are ordinarily termed serous cysts; and, thirdly, as cysts formed around the embryos of the tænia echinococcus, and which are designated hydatid cysts. In the glandular variety the sac is lined by the epithelium of the secreting apparatus; in the lymphatic variety the lining is endothelial; while in the hydatid cyst the capsule is merely fibrous, without either an epithelial or an endothelial investment.

The independent formation of a cyst around a fibrous coagulum has been recorded by Schuh[1] and Gay.[2] Albers[3] has described a dermoid cyst containing hair and sebum, and supposed sebaceous cysts, which were probably nothing more than inspissated lacteal cysts, have been removed by Gerdy,[4] Laurence,[5] and Dieffenbach.[6]

Excluding the formations referred to in the preceding paragraph, mammary cysts may be simple or multiple, unilocular or multilocular, and may affect one or both glands. Although they are of quite common occurrence, they are, when compared with the neoplasms, very infrequent, as they constitute less than 2 per cent. of all tumors of the breast.

1. Glandular or Retention Cysts.

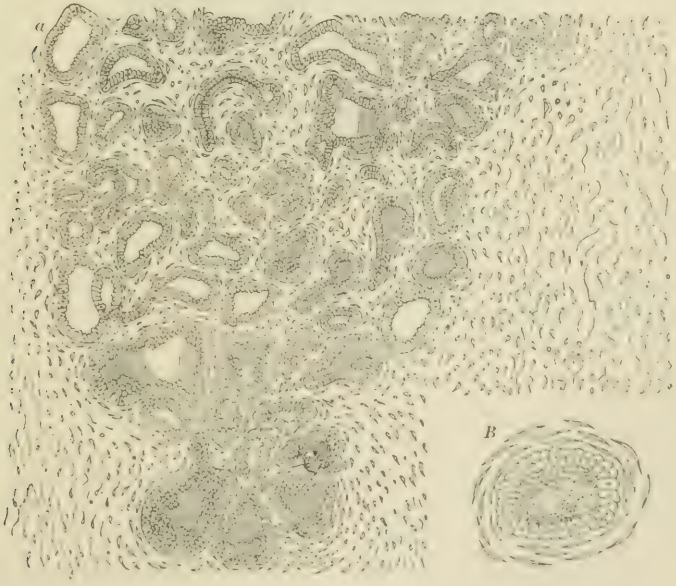
When from any cause whatever the lacteal ducts are obstructed, constricted, or obliterated, the glandular apparatus behind the lesion is converted into a sac through retention and accumulation of its more

[1] Klebs: *Handb. der Path. Anat.*, p. 1197.
[2] *Boston Med. and Surg. Journ.*, 1878, p. 90.
[3] *Erläuterungen*, Bd. iii. p. 589.
[4] Velpeau: *Diseases of the Breast*, Syd. Soc. ed., p. 247.
[5] *Ibid.*, p. 248.
[6] Lebert: *Bull. de la Soc. Anat.*, 1852, p. 42.

or less altered secretion, thereby giving rise to the retention, glandular, or epithelial cyst. The affection may arise from malformation of the nipple; from inflammation due to injury or puerperal mastitis; from the presence of small vegetations in the ducts;[1] from cicatricial contraction of the fibrous stroma of the mamma; from errors of development during the unfolding of the gland after the establishment of the menses, through which, as Meckel suggested, the lobules form more rapidly than the ducts; and, finally, from perverted activity of the secreting apparatus, the exciting cause of which is often obscure.

From a careful minute study of ten breasts, I am convinced that retention cysts, particularly those which occur after the menopause, develop principally as the result of morbid changes in the epithelium of the acini, although the ducts do not escape. The epithelium proliferates and accumulates in the acini, through which the latter are more or less closely packed with angular and polyhedral cells. The cells then undergo retrogressive changes, by which they are converted into a lactescent or mucoid fluid, so that a single acinus appears as an

FIG. 60.



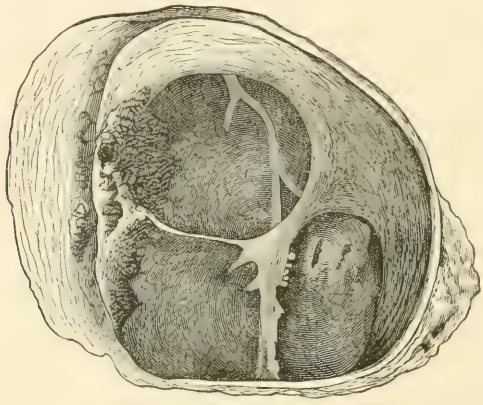
Multiple Retention Cysts. *a*, × 70; *B*, × 240.

enlarged ovoid or round cavity surrounded by its membrana propria invested by a layer of cuboid or cylindrical cells. As a rule, all the acini of a lobule participate in these alterations, as is well shown in Fig. 60, from Labbé and Coyne, which represents multiple cysts

[1] Rogeau: *Bull. de la Soc. Anat.*, 1852, t. xlix. p. 108.

forming as the result of cicatricial contraction of the interlobular connective tissue. The cyst increases in dimensions by the fusion or coalescence of the contiguous acini, as is frequently demonstrated by the projection of the remains of the septa or partition walls, in the form of irregular connective tissue papillæ, into the common cavity. These processes sometimes persist and enlarge, so that the inner surface of the cysts is here and there studded with minute, soft, vascular, microscopic excrescences, which impart to it a villous appearance. In the larger multilocular cysts the intersecting bands are greatly thickened, as shown in Fig. 61, from Virchow.

FIG. 61.



Multilocular Retention Cyst.

For convenience of description, glandular or retention cysts may be divided into the simple, which comprise the so-called mucous, serosanguinolent, and hæmatic, and the lacteal, which include the oil and butyroid cysts of various authors.

A. *Simple Cysts.*—From an analysis of 70 cases of simple cysts, including 10 under my own care, I am enabled to present the following salient features of their pathology: They constitute globular, ovoid, or pyramidal tumors, which vary greatly in size, considerable volume being exceptional, and the contents of which, no matter what their physical appearances may be, are always albuminous—a point which suffices to differentiate them from the connective tissue cysts. The tumor is single in 50 per cent., and multiple in an equal percentage of all instances, while one breast is involved in 65.71 per cent., and both breasts are affected, simultaneously or successively, in 34.28 per cent. of all cases. The disease is met with as early as the fifteenth and as late as the sixty-first year: 47.14 per cent. of the cases occur between forty and fifty years, 28.57 per cent. between thirty and forty years, 12.85 per cent. between fifty and sixty years, and 11.42 per cent. prior

to the thirtieth year. The majority of the patients are married and fruitful, and do not suffer from menstrual disorders. The disease is attributed to trauma in 12.85 per cent. of all cases, and it is curious to note that the mother of two patients had died of mammary carcinoma, the grandmother of two others had perished from the same disease, while the grandmother of a fifth had died of carcinoma of the uterus. The tumor itself is, as a rule, firm, tense and elastic or hard, fluctuation, contrary to what might be expected, being uncommon. It is not attached to the skin; the subcutaneous veins are not prominent; the nipple is sunken or umbilicated in 5.71 per cent. of all cases; inflammation and ulceration are met with in 4.14 per cent.; and the axillary glands are the seat of irritative enlargement in 10 per cent. of all examples. A sense of uneasiness or pain is experienced in 11.42 per cent., in one-fourth of which it is sharp and lancinating, and there is a discharge from the nipple in 15.71 per cent.

The preceding facts afford little clue to the true nature of the disease as met with during the period of functional activity and the period of functional inactivity of the breast. Hence, simple retention cysts, in accordance with the period of their development, may advantageously be separated into involution and evolution cysts, the former appearing after, and the latter before, the menopause.

a. Involution Cysts, or those which occur in the atrophying or obsolescent gland, develop in the acini and smaller ducts, and are due to changes induced by the sclerosed and contracting fibrous tissue, which not only constricts the ducts, but also induces irritative hyperplasia of their epithelium as well as that of the acini. They embrace the majority of the cases recently described by Reclus[1] as "la maladie kystique des mammelles," and badly termed intraäcinous cystic epithelioma by Brissaud,[2] who made a minute examination of the specimens.

From notes of 30 examples which I have seen and collated from various sources, I find that the cysts which develop, without assignable cause, except in 10 per cent. from traumatism, after the menopause, occur between the forty-first and sixty-first years, or at an average age of forty-nine, in women who have usually been married and who have borne children. They are, as a rule, seated at the posterior surface and periphery of the lower hemisphere of the breast, vary in size from a pea to a pigeon's egg, and contain a greenish, brownish, greenish-brown, or blackish viscid fluid, although the contents may be clear and transparent, citron-colored, yellowish, or sanguinolent.

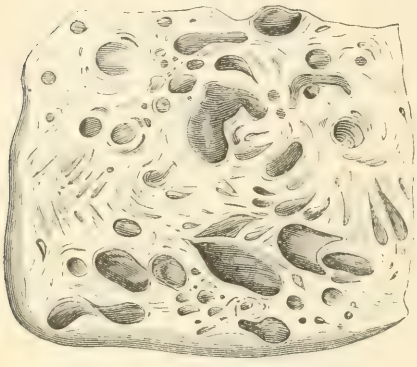
In two-thirds of all instances multiple cysts are met with, and both breasts are affected, simultaneously or consecutively, in one-third of all cases. Under these circumstances small cavities are disseminated throughout the gland, hundreds being visible to the naked eye, as in

[1] *Rev. de Chir.*, 1883, p. 761.

[2] *Arch. de Phys. nouv. et path.*, 1884, p. 98.

Fig. 62, from a specimen in the Gross Museum. In other examples, and they are not rare, one or more sacs, varying in dimension from a cherry to a walnut, are seated near the nipple, and smaller cysts are scattered through the gland and at its periphery, the contents being, as a rule, either clear or of a light greenish tint. In a single example, in which the disease was limited to one breast, recorded by Lawson,[1] there were two large sacs which had replaced the entire organ, and rendered it so heavy and bulky as to require support in a sling. In the remaining third of the cases the cyst is single, varies in size from that of a hen's egg to that of a double fist,[2] and its contents are almost invariably discolored.

Fig. 62.



Multiple Involution Cysts of the Breast.

The *diagnosis* of multiple cysts is not easy, not a few breasts having been removed under the supposition that the disease was carcinoma. From the extreme distension of the cavities and the fact that they are generally deeply seated in the breast, fluctuation is usually absent, a slight sense of fluctuation being present in the exceptional instances of the larger cysts, which are superficial and found in the vicinity of the areola. In only 2 of the 20 examples of multiple cysts was there a discharge from the nipple, so that the age of the patient, the hard, irregular, and knotted feel of the breast, and, it may be, the presence of an enlarged gland in the axilla, as in the examples witnessed by Paget[3] and Poncet,[4] or of an enlarged gland in each axilla, as in a case of symmetrical disease under my own care, as well as the absence of fluctuation and a discharge from the nipple, are very suggestive of carcinoma. The same statement is true of the exceptional cases of the occurrence of cysts in a gland hardened by previous puerperal mastitis, with retraction of the nipple. The comparative greater frequency of axillary involvement and retraction of the nipple, and the comparative rarity of multiple nodules, as well as of invasion of both breasts, in carcinoma, are, however, valuable aids in the differential diagnosis; but in cases of doubt the breast should not be removed without first resorting to an incision to reveal the true nature of the disease.

[1] *Trans. Path. Soc. London*, vol. xxi. p. 354.

[2] Richelot: *Des Tumeurs kystiques de la Mammelle*, 1878, p. 113.

[3] *Op. cit.*, p. 408.

[4] *Gaz. Hébd.*, 9 April, 1886, p. 244.

When, on the other hand, the cyst is single or double, of considerable volume, and situated superficially, its pyramidal, globular, or ovoid shape, nodulated or slightly lobulated outline, the thinned state and violaceous or dusky-red tint of the skin, the fluctuation, and probably a discharge from the nipple, are signs that cannot be mistaken. Not a few of single cysts, when deeply seated, have, however, been confounded with fibroma and adenoma.

Multiple involution cysts, especially if they affect both breasts, should be let alone, unless they occasion mental and bodily discomfort, when the entire gland must be excised. The management of one or more large cysts does not differ from that of evolution cysts.

β. Evolution cysts, or those which form during the period of the functional activity of the breast, are usually due to dilatation of the lacteal sinuses and larger ducts, since only about one-fourth originate in the same way as do the cysts of the senile gland. Of 40 examples that I have analyzed, 6 of which came under my personal observation, the tumor was single in 25 and multiple in 15. The disease was limited to one breast in 26, and both breasts were affected in 14. The walls, as a rule, are thin and vascular, while in rare cases they are calcified.[1] The contents, originally of a lactescent nature, vary greatly in their appearances. In 5 per cent. of all cases they are greasy and oleaginous; in 25 per cent. they are serous; in 25 per cent. they are of a reddish hue or serosanguinolent; and in the remainder they are of a green, brown, greenish-brown, black, dark-red, or yellow tint from altered hæmatin, and frequently contain plates of cholesterin. Although, when solitary, they are usually of the size of a walnut, they may constitute globular or ovoid tumors as large as a goose's egg, a fist, or, as in the case of Marini,[2] may contain nine pounds of fluid. When multiple, hundreds may be scattered throughout the gland, their volume varying from that of a hempseed to that of a pigeon's egg. In this event their walls are liable to be thick.

Single cysts are most common in the central area of the breast, and are decidedly frequent near the areola from implication of the lacteal sinuses. They may, however, originate in the accessory glands which lie in the connective tissue immediately beneath the areola, and which Sinéty[3] has demonstrated to exist, to the average number of four, in every fourteen out of fifteen women. A case described by Velpeau,[4] in which a young girl could express a reddish fluid through a small opening two lines below the nipple, doubtless comes under this category. Multiple cysts, on the other hand, usually develop at the posterior surface of the mamma and at its periphery.

[1] Velpeau: *Diseases of the Breast*, Sydenham Soc. ed., p. 272.

[2] *Gazette des Hôpitaux*, 1838, p. 282.

[3] *Bull de la Soc. Anat.*, t. lii. p. 460.

[4] *Op. cit.*, p. 251.

The disease is most frequent in comparatively young married and prolific women. Thus, of the 40 cases, of 19 the age was from thirty to forty years, of 9 from twenty-one to twenty-eight, of 1 fifteen, and of 11 from forty-one to forty-seven, or of the thirty-fourth year on an average; while 27 were married and, as a rule, parous, and 13 were single. Six examples were directly attributable to injury, but the exciting cause was inappreciable in the remainder.

The outline of evolution cysts is usually smooth, nodulation or bosselation being rare even when the sac is large. Their volume, as a rule, hardly exceeds that of a walnut, that of a filbert or a pigeon's egg being attained in a year, although in one of my cases the size of an orange was reached in that time. Billroth[1] records one as large as a goose's egg in five years; and Richelot[2] one of the bulk of the fist in fifteen years; while in the case of Marini the cyst contained nine pints of a serous fluid in the short space of three months. On the whole, it may be said of these cysts that their volume is moderate and that their increase is slow.

The consistence of evolution cysts is usually firm and elastic, fluctuation being distinct only in exceptional instances. In one example out of every four and four-ninths there is a discharge from the nipple, but it is spontaneous in only one-half of these, and is liable to be bloody when a lacteal duct is partially occluded by a small vegetation. The mammilla itself is deformed in one case out of every ten, being buried through the projection of the sac beyond its level, and preventing suckling. There are no adhesions to the skin or to the chest; the subcutaneous veins were prominent in one example of a large inflamed solitary cyst; there is slight pain in one case out of every seven and one-third; and the partially translucent cyst may have a bluish tint in exceptional instances.

They are not very liable to inflammation or ulceration. In the case of Richelot the sac suppurated and ulceration and gangrene of the skin ensued; in one recorded by Bryant[3] several ounces of pus were evacuated from a suppurating monocyst; while in one instance of multiple cysts, recorded by Sir Astley Cooper,[4] several ulcerated, but subsequently healed. In the cases of Richelot and Cooper there was an enlarged gland in the axilla, a condition which was met with, as the result of irritative hyperplasia, in two other cases,[5] both of which were examples of multiple cysts.

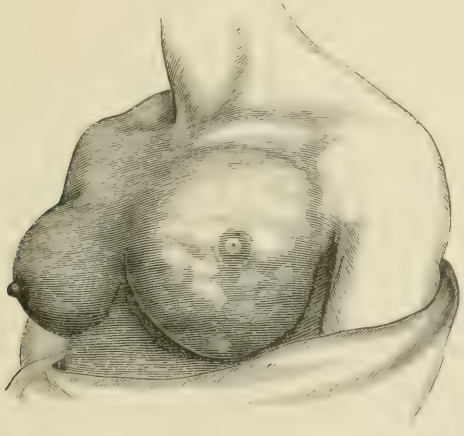
From the preceding facts, deducible from the general history of evolution cysts, it appears that they differ from involution cysts in the

[1] *Chir. Klinik,* Wien, 1869–70, p. 143.
[2] *Op. cit.,* p. 112.
[3] *Guy's Hosp. Reps.,* vol. xliii. p. 452.
[4] *Loc. cit.,* Case vi. of hydatid tumors.
[5] Demarquay: *Bull. de la Soc. Anat.,* t. xxxvi. p. 326; and Verneuil: *Le Progrès médical,* 6th March, 1886, p. 302.

following particulars: They appear at a far earlier age; develop during the period of functional activity of the breast; are most common as single tumors in one gland; and are more frequently attended with a discharge from the nipple.

The diagnosis of a small cyst is impossible without a resort to the exploring needle, since its firm or hard consistence, mobility, and painless and chronic course render it very liable to be confounded with a small solid neoplasm. A pyramidal or ovoid growth which presents these features, and which is seated near the nipple of a married woman between twenty-one and forty years of age, and which is preceded by or attended with a discharge from the nipple, may reasonably be suspected to be an evolution cyst, while distinct fluctuation and a bluish tint go far to clear up the true nature of the case. When multiple the breast may present a bossed appearance, as in Fig. 63, from Agnew;

FIG. 63.



Multiple Cysts of the Breast.

but the characters of the individual bosses or tubers are merely those of a single cyst.

When solitary and of moderate volume, draining off the fluid by a small trocar and canula frequently brings about a cure, but, this failing, tapping and the insertion of a drainage tube may effect the object even if the cyst have a capacity of four ounces. When large, the injection of iodine or carbolic acid, incision and packing with iodoform lint, or antiseptic incision and the insertion of a drainage tube, will be required; but the surest plan of treatment is excision of the cyst, which must give way to extirpation of the breast if the sacs be multiple, a sufficiency of integuments being preserved to admit of accurate closure of the wound.

B. *Lacteal Cysts.*—Galactoceles, or cysts containing either pure or

altered milk, are even more rare than simple cysts, and are due almost exclusively to dilatation of the sinuses and larger ducts, the majority being found in the immediate vicinity of the nipple and areola. In accordance with their consistence they are divided into liquid and solid galactoceles, the former predominating. Of 25 cases which I have collated, inclusive of 4 under my own care, the contents were pure milk in 12; of the nature of cream in 4; oil in 1; of a partly curdy material and partly fluid character in 1; of a semisolid, dry, grayish-white curd or caseous matter, which is composed of broken-down epithelial cells, globules of oil, and acicular crystals of palmitine and stearine, or a mixture formerly called margarine, in 6; and of the nature of butter, whence the term butyroid cyst, in 1. These variations in the character of the contents are dependent upon the chemical and mechanical changes which the milk undergoes, the inspissation becoming more marked as that fluid parts with its watery constituent and as the albuminous elements predominate. Calcification of the caseous mass, which has been observed in animals, and which is said by some authors to occur in the female breast, appears to be rather a tradition than a fact founded upon actual observation.

Lacteal cysts are almost invariably solitary, the only exception to the rule of which I have any knowledge being a case recorded by Forget.[1] In this case, in addition to the principal sac, which was of the volume of a double fist, there were two others of the size, respectively, of a pigeon's egg and a hazelnut. These cysts are not liable to inflammation, although in the instance just mentioned the wall of the largest was the seat of two ulcers, the bases of which were formed by the softened and slightly suppurating mammary tissue. Sir Astley Cooper[2] states that ulceration, with escape of its contents, sometimes follows excessive distension of the sac; but the cases which I have examined do not confirm this assertion.

Galactoceles are generally observed during lactation. Thus, of 23 examples in which the date of appearance is noted, 19 occurred at a period which varied from ten days to seven months after parturition, and usually within three months; 1 developed sixteen months before childbirth, and increased most rapidly after weaning;[3] 2 appeared during pregnancy; while in a remarkable instance recorded by Bouchacourt[4] an enormous cyst, filled with pure milk, formed in a woman fifty-one years of age twenty-four years after her last accouchment. In two examples the disease was attributed to a blow, and in at least one there was antecedent mastitis.

[1] *Bull. Gén. de Therapeut.*, t. xxvii. p. 359.

[2] *Diseases of the Breast*, Philada., 1845, p. 19.

[3] W. F. Atlee: *Amer. Journ. Med. Sciences*, April, 1874, p. 419.

[4] Richelot: *op. cit.*, p. 18.

The outline of a milk cyst is globular or ovoid, and not infrequently somewhat nodulated, while its volume and rate of increase depend upon the nature of its contents. Thus, when the contents are fluid it may grow rapidly and acquire the capacity of two, six, and even ten, pints in a short time, as in the celebrated case of Volpi, usually attributed to Scarpa.[1] In this case the breast began to enlarge ten days after parturition, and in less than two months measured thirty-four inches in circumference and rested upon the thigh when the patient was seated. On the other hand, when the accumulation is slow the increase is so gradual that the sac may contain only ten ounces in thirteen years, as in an example recorded by Birkett.[2] When the contents are converted into a cheesy mass, the size and growth vary from the dimensions of a pigeon's egg in seven months to those of a child's fist in three years.

During its entire course a galactocele is unattended with pain or tenderness; the skin is not discolored; the nipple is natural, except in rare cases in which the swelling protrudes beyond its level and interferes with suckling; the axillary glands are not enlarged; there are no adhesions; and the general health does not suffer.

A large, solitary, pendulous, painless, soft, and fluctuating tumor, with prominence of the subcutaneous veins, which formed suddenly during lactation, may safely be pronounced to be a cyst containing milk; and the diagnosis is confirmed if, as occasionally happens, a few drops of that fluid can be made to escape from the nipple. When of moderate volume, a liquid galactocele will usually be found to increase in size at each successive parturition, to become tense during suckling, and to decrease, or even disappear, with the cessation of lactation. Despite these changes in volume, it, however, continues to grow slowly, and is the seat of fluctuation.

When, on the other hand, the contents are of a semisolid or cheesy nature, the distinction between a lacteal cyst and a small fibroma is scarcely apparent. Thus, in a lady twenty-four years of age, whom I recently saw, there was a round, slightly nodulated, firm, and painless tumor just internal to and above the areola, which rolled under the finger, was of the volume of a hickory-nut, and was of sixteen months' duration. As it developed two weeks after parturition, I inclined to the opinion that it was a solid galactocele, but I was not certain as to its true nature until an exploratory incision gave vent to its curdy contents. In such cases the swelling is observed, soon after its commencement, to fluctuate; but it gradually becomes solid, and frequently diminishes in size, and may even retain the impression of the finger.

Upon the whole, in the absence of exploratory puncture, the development of a tense, fluctuating swelling, without signs of inflammation,

[1] Boyer: *Maladies Chirurgicales*, 1st ed., t. vii. p. 287; and Forget: *loc. cit.*, p. 356.

[2] Holmes' *System of Surgery*, 3d ed., vol. v. p. 448.

during pregnancy or lactation, affords presumptive evidence of a milk cyst.

The treatment of lacteal cysts should be based upon the size of the tumor. When of moderate dimensions the contents may be evacuated and the sac injected with a few drops of carbolic acid; or the cyst may be laid open and wiped with tincture of iodine or a strong solution of chloride of zinc; or it may be excised—a method of treatment which is more severe than the others, but one which will be followed by a more rapid recovery. When quite small it is even possible to bring about absorption without resorting to surgical measures. Thus, in one of my patients who declined active interference the application of ammoniac plaster with mercury for two months caused the disappearance of a cyst, the true nature of which had been determined by the exploring needle, of the volume of a large cherry, which was seated above and internal to the nipple.

When the tumor is bulky the procedure usually recommended is to evacuate the contents and insert a drainage tube, the child at the same time being weaned, and the secretion of milk arrested by appropriate external and internal medication. The objection to this method of treatment is that a fistulous passage is established, which refuses to heal, so that many months may elapse before the object is accomplished. Hence, voluminous tumors, especially when the wall of the sac is much thickened, are best managed by antiseptic incision and drainage, the operation differing in no wise from that practised by Volkmann for the relief of hydrocele of the vaginal tunic, except that bichloride of mercury should replace carbolic acid as the germicide.

2. Connective Tissue or Lymphatic Cysts.

Connective tissue, endothelial, lymphatic, or serous cysts are due to the collection of fluid in the interfibrillar lymph spaces of the connective tissue stroma of the breast, which subsequently enlarge and coalesce, and constitute a cavity lined by a fibrous wall invested with endothelium or a layer of flattened connective tissue cells. In the present state of our knowledge a full and accurate account of lymphatic cysts cannot be written, not because they are uncommon, but for the reason that the records are imperfect as regards the histology of the cyst wall. They doubtless, however, include the "thin membranous cyst, containing a transparent watery fluid, without coagulable matter," of Sir Benjamin Brodie,[1] as well as the sero cysts of Birkett,[2] the contents of which are not coagulable by heat or nitric acid, the wall of which is lined with "squamous epithelium," and which is "always perfectly closed, and never communicates with a duct."

[1] *Works of Sir Benjamin Brodie*, vol. iii. p. 229.

[2] *A System of Surgery*, edited by Holmes and Hulke, 3d ed., vol. iii. p. 448.

The first true description of the connective tissue cyst, based upon minute examination of its wall, was published by Gadsby,[1] in 1878, in the case of a breast removed by Marshall. The hardness of the small tumor, which was seated at the outer side of the right nipple, its faint lobulation and deep attachment, along with the slight induration of the axillary lymphatic glands, and the age of the patient, gave rise to the suspicion of a slowly growing scirrhus. Many cysts were disseminated throughout the breast, and the main one was filled with a brownish mucoid fluid, and its wall, stained with nitrate of silver, showed the characteristic endothelial lining. Hence, Gadsby termed it a lymphatic cyst.

The only paper containing anything like a satisfactory account of the disease, founded upon the structure of the wall of the cyst, is that of Butlin, which appeared in April, 1884; but the cases which he had seen and collected are so few that the general history of the affection remains to be written. In the three cases detailed by Butlin, as well as in that of Gadsby, the breast was supposed to be carcinomatous; and in a few months after reading Butlin's paper I actually amputated the breast under the firm conviction that the disease was carcinomatous. The case was that of a 3-para, forty-eight years of age, who still menstruated, and who accidentally discovered, two months previously and six weeks after striking the breast against a door, a densely hard nodule, of the volume of a filbert, in the upper and outer quadrant of the right gland. Her mother had died of mammary carcinoma, and the nipples were intracted, so that she had never suckled her children. The amputated gland contained five cysts, of which the largest represented the tumor felt before the operation, filled with a dark greenish fluid, and the walls of which had an endothelial lining.

The contents of lymphatic cysts are of a clear, straw-colored, turbid, greenish, or brownish hue; but as the fluid was lost in the cases examined by Gadsby, Butlin, and myself, it is impossible to confirm the statement of Birkett that it is nonalbuminous. Should the statement, however, be verified by more extended and careful investigations, the nature of the fluid will prove invaluable in the differential diagnosis of the various mammary cysts. As I have seen only one case of the affection, I am obliged to make the following quotations from Butlin, which illustrate its life-history:

"The patients in the cases which I have seen and collected were, without exception, over forty years of age, and the oldest of them was sixty-six. Some of them were married, some were single, but in no instance was the disease attributed to pregnancy or to the bearing or suckling of children.

"The cysts, whether single or multiple, seldom attained a large size;

[1] *The Lancet*, vol. i. 1878, p. 234.

most of them are described as about the size of a pigeon's egg, and the largest was not larger than a small orange. Yet the duration of the disease was two years in one case and five years in another. It is, however, right to say that most of the tumors were operated on when they had been noticed a few weeks, or at most six months, generally because they were believed to be cancerous. Although the fluid is usually tightly enclosed in the capsule, they are not generally very painful; indeed, absolute freedom from pain was noted in the majority of instances.

"It need scarcely be stated that the diagnosis of connective tissue cysts from carcinoma is often exceedingly difficult; the cases which have been related are sufficient proof of this. When the cyst is single, of large size, situated in a small breast, and not too deeply placed, it is usually easy to detect fluctuation; but when the cysts are multiple and small, and surrounded by, or imbedded in, indurated tissue, or when there is a single cyst, very tense, deeply situated in the substance of a large flat breast, it is, I believe, impossible to be certain of the nature of the disease. The suspicion that it is not carcinoma must rest on the absence of several of the lesser signs of carcinoma, such signs as retraction of the nipple, adherence of the skin, and enlargement of the glands."

From the foregoing description it is evident that connective tissue cysts, like involution retention cysts, occur during the functional inactivity of the breast. In both varieties the cysts are frequently multiple, hard, and do not fluctuate, and are commonly confounded with carcinoma. Lymphatic cysts do not appear, however, to attack both breasts, and they are never attended with a discharge from the nipple. These points, along with the nonalbuminous nature of their contents, may prove serviceable in their diagnosis from evolution cysts.

In the treatment of connective cysts mild measures frequently bring about a cure. When the cyst is single, simple puncture, with the application of an embrocation consisting of chloride of ammonium, alcohol, and camphor mixture, succeeded in affording permanent relief in eighteen cases in the hands of Birkett.[1] Should the cysts be multiple and not excite apprehension, they may be let alone. Under opposite circumstances, if the breast be filled with cysts, it should be excised, but should a few cysts lie close together, they may be opened and drained through a single incision.

3. Hydatid Cysts.

When the embryo of the tænia echinococcus finds its way into the stroma of the mamma, it is transformed into a vesicular worm, and is soon encapsuled by a fibrous membrane of new formation, in which it

[1] *A System of Surgery*, edited by Holmes, 2d ed., vol. v. p. 266.

grows and multiplies until it occasions a tumor which may attain the volume of a fist. It is the most uncommon of all the cysts of the breast, as is shown by the fact that, up to 1874, Haussmann[1] of Berlin had been able to collect only sixteen examples, to which may be added seven cases recorded, respectively, by Lauenstein,[2] Landau,[3] Guermonprez,[4] Fischer,[5] Höppener,[6] Rizzoli,[7] and Medini.[8] In the case of Landau the sac communicated, by an opening three centimeters square through the ribs and intercostal muscles, either with the cavity of the chest or the abdomen, but it was impossible to determine whether it was connected with the pleura, the diaphragm, or the liver. In none of the remaining twenty-two cases did the parasites reach their destination by ulceration through the wall of the chest, but they entered it through the usual channel of the circulation.

In the majority of instances there is a single cyst with scolices adhering to its inner wall or germinal membrane or floating in its clear, non-albuminous, saline fluid; while in the others there is a parent cyst containing from one to four, but rarely more, smaller vesicles, the size of the former varying between that of an apple and that of a man's fist. The limiting capsule is composed of vascular connective tissue, and may reach the thickness of two-fifths of an inch.

Hydatid cysts occur as early as the seventeenth and as late as the fifty-sixth year. Of 16 cases in which the age is noted, 1 first appeared at seventeen; 10 between twenty and thirty years; 2 between thirty and forty years; 2 between forty and fifty years; and 1 after the age of fifty. Their growth is extremely slow, although it is very variable. Thus, they may attain the size of a filbert in eleven months, of a small egg in two years, of an orange or a cocoanut in five years, of a pigeon's egg or a fist in six years, or of an apple in three or eight years; so that, while an average rate of increase cannot be assigned to them, the endogenous hydatid may be said to be of slower growth, although it finally acquires a larger volume, than the single cyst. Their increase is materially hastened by trauma, and in one instance appeared to advance during lactation.

From the twenty-two cases which are available for writing the life-history of these tumors, it appears that they grow slowly, attain moderate size, are painless, of a round and smooth outline, of a firm or firm and elastic consistence, mobile under the skin, not attached to the

[1] *Die Parasiten der Brustdrüse*, Berlin, 1874.

[2] *Ueber das Vorkommen von Echinococcus in der Mamma*, Inaug. Dissert., Göttingen, 1874.

[3] *Archiv für Gynäkologie*, Bd. viii., 1875, p. 359.

[4] *Archives de Tocologie*, 1884, p. 14.

[5] *Deutsche Zeitschrift für Chirurgie*, Bd. xiv. p. 366.

[6] *St. Petersburg med. Wochenschrift*, No. 51, 1881, p. 449.

[7] *Bull. delle Sc. Med. Bologna*, vol. xii., 1883, p. 168.

[8] *Ibid.*

chest, seated at the upper and outer part of the breast and never in the immediate vicinity of the nipple, free from changes in the skin, veins, and lymphatic glands, little liable to inflammation, and do not impair the general health.

Deviations from this general course were indicated by pain in 5 instances; by slight tenderness on manipulation in 5; by a nodulated outline in 4; by fluctuation in 7; by attachment to the skin in 5; by irritative hyperplasia of the axillary glands in 2; and by inflammation, with ulceration and the escape of purulent fluid, which had accumulated between the parasite and the enclosing cyst as a result of irritation, in 5.

While the prognosis is highly favorable, the diagnosis is most obscure, the discrimination between it and a simple cyst being impossible, but being easy when compared with a lacteal cyst which appears during lactation and is usually prominent in the vicinity of the nipple. In two cases it was thought to be carcinoma; and it is also liable to be confounded with other neoplasms, unless exploratory puncture be resorted to.

The treatment should be limited to incision with drainage, or incision and dressing from the bottom, the operation selected depending upon the size of the cyst.

DISEASES OF THE BREAST OTHER THAN TUMORS.[1]

By ROSWELL PARK, A. M., M. D.,

Buffalo.

It seems unnecessary to go into the ordinary details of the anatomy of the mammary glands. Their site, average size, etc. are too commonly noted to call for description here. But certain facts less familiar deserve mention. Ordinarily, they reach from the third to the seventh rib vertically, and externally to the axillary borders. The apparent size of the breasts is in large degree a matter of adipose tissue, since even in the bosom of large volume there may be little if any more glandular tissue than in one of half its apparent size. They are not, furthermore, always of the same size.

We speak commonly of the four quadrants of the breast, though Hennig has shown that the natural division is rather into thirds, one inner and two outer. The nipple is not usually placed in the exact centre of the rudely circular mammary base, but will be found a little above and inside of that point. According to Luschka, in 44 of 60 individuals examined the nipple lay over the fourth intercostal space, six times over the third rib, eight times over the fourth rib, and twice over the fifth intercostal space. Sixteen times out of fifty the right nipple was found farther from the middle line than the left.

The base of the mammary gland is somewhat oval, having its longest diameter directed upward and outward toward the axilla. It lies imbedded in connective tissue continuous with the superficial fascia, by which it is in a measure swung from the clavicle, and rests upon the great pectoral muscle, separated from it by a layer of firm areolar tissue continuous with the deep fascia. Prolongations of the lobules sometimes pass into the surrounding tissue beyond the apparent limits of the breast. By a circular sweep of the knife, and the removal of the breast therewith, a little of this gland-tissue might thus be left.

The mammæ are compound racemose glands, and, like all other glands of the skin, arise from a bud-like invagination of the rete

[1] For puerperal disease of the breast, see *System of Obstetrics*, Vol. I.

Malpighii of the skin, appearing at about the third or fourth month of intra-uterine life. Soon this bud sends out as many pear-shaped processes as there will be lactiferous ducts (Fig. 64). These remain almost unchanged until about the age of puberty in the female, and almost never develop any further in the male. They have fibrous walls derived from the connective tissue of the skin, and are lined with epithelium. At their blind extremities are aggregations of these epithelial cells, and it is not uncommon to find, soon after birth, the whole process greatly distended with these cells in every stage of degeneration, often

FIG. 64.

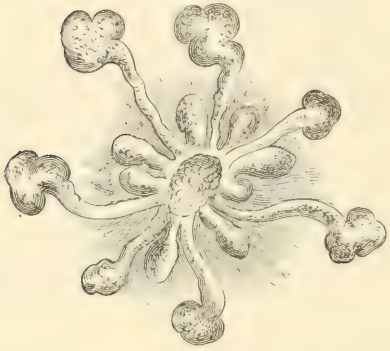


FIG. 65.

giving rise to a mastitis which may, according to Kölliker, destroy the process and lead to a poorly-developed or small breast. At the age of puberty in the female the processes rapidly (Fig. 65) lengthen and break up into numerous sac-like ramifications, each of which again leads to the formation of a cluster or lobule of acini. These are bound together by white fibrous connective tissue, with occasional elastic fibres. The acini or alveoli are the proper secreting portion of the gland, and are lined with small polyhedral cells lying on a membrana propria. The ducts leading from them to the nipple also have a membrana propria, but are lined with cylindrical epithelium. In the maiden breast the connective tissue surrounding the lactiferous ducts is peculiar, and unlike that enveloping the lobules in that it is coarser and tougher than the latter, is more cellular, and has a hyaline appearance, giving the organ that elastic, tense consistency peculiar to the virgin. The nipple, though quite marked and well developed at birth, undergoes very little change until after the age of puberty is reached, when it also increases in size with the rest of the gland. It is pierced by from twelve to fifteen lactiferous ducts, whose orifices are scarcely large enough to allow the passage of a bristle. Besides these and connective tissue the nipple contains numerous bundles of smooth muscle-fibre (Fig. 66) which surround the ducts and run in various

directions. They have been traced along the ducts, and some investigators have even found stray fibres in the tissues around the lobules. The arteries of the mammary glands are derived from the mammaria interna and thoracica longa. They anastomose very freely, and form a capillary network round the lobules; from these numerous veins arise

Fig. 66.

which follow the arteries and form a very dense plexus of veins under the skin, and finally end in the vena mammaria interna and thoracica longa. Some of the subcutaneous veins, however, empty into the vena jugularis externa (Luschka). The lymphatics are very numerous, and surround the lobules with the blood-vessels, forming a network. They do not communicate with the connective-tissue spaces, but follow the ducts out of the gland. In the skin they begin with sac-like dilatations and form cutaneous and subcutaneous plexuses. Ultimately, they empty into the glands of the axilla and thorax (Luschka). The nerves of the mammary glands are largely spinal, and are derived from the fourth to the sixth intercostals. They follow the ducts into the gland, and are lost in the walls of the acini. Their connections with the cervical and brachial nerves must not be forgotten, for thereby is explained the radiating pains of which many patients with breast troubles complain so bitterly.

It is during the first pregnancy that the mammary gland reaches its highest development. Now the acini will be found to increase rapidly in size and number (Fig. 67); the connective tissue becomes succulent, more vascular, and more cellular, so that, while it is almost impossible in the virgin breast to separate the lobules from the investing connective tissue, and the whole gland appears to the naked eye like a mass of tough connective tissue, they can now be distinctly seen and easily separated. The lactiferous ducts become

dilated and sacculated from the pressure of accumulated secretion, forming the so-called sini lactei, and the nipple increases in size.

Fig. 67.

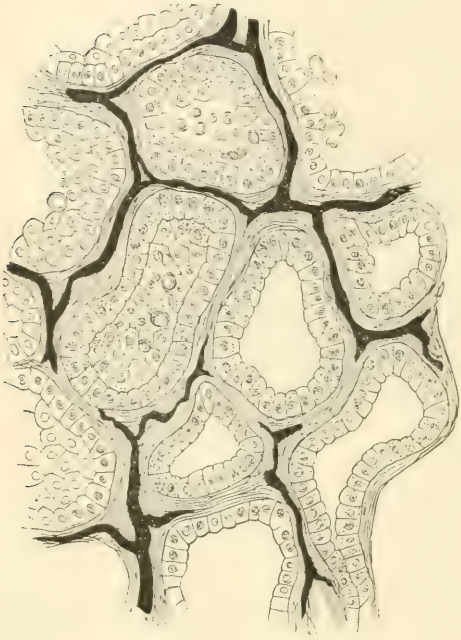


Fig. 68.

When lactation ceases the acini collapse, but do not disappear, holding themselves in readiness, as it were, for the next pregnancy. The connective tissue does not return to its former characteristic condition, but remains soft and flabby, and shows a marked tendency to become fatty. After the menopause is reached, when the whole gland atrophies, the acini with their epithelium disappear and are replaced by fat; only the ducts remain, and even their epithelium degenerates and dies (Fig. 68).

All these internal changes need not necessarily change the external appearance very much, since fat is substituted for the gland-tissue proper if the general nutrition of the individual be good.

Congenital Defects and Excesses; Vices of Conformation.

Absence of Mammæ; Amazia; Micromazia.—Total absence of one or both breasts is a very rare congenital defect. Maraudel[1] speaks of one case; Lousier,[2] whose daughter had the same defect, also of

[1] *Dict. d. Sci. Med.*, xxx. 378.

[2] *Diss. sur la Lactation.*

one; and Froriep[1] of one. In each of these one breast was fairly developed, the other one totally wanting. In Froriep's case there was also deficiency of the underlying ribs and the pectoralis major was absent.

When the ovaries are found to be rudimentary the breasts are usually very ill developed; this constitutes *micromazia*. Such cases have been observed by Cooper, Caillot, Laycock, and Ebstein. In many other cases the breasts are found to be more or less rudimentary, so that they are incapable of performing their proper lacteal function.

Supernumerary Mammæ; Polymastia; Pleiomazia; Polymazia.—Supernumerary Nipples; Polythelia.—Excesses of formation are more common than total defects, and have been observed in both sexes. They may be easily explained as one of the features of that earlier and lower condition in which the number of breasts seems to correspond to the number of progeny in a litter. Thus looked upon as a temporary reversion to an earlier type or a manifestation of *atavism*, they are no more to be wondered at than hare-lip or imperforate rectum. The Diana of the Ephesians and the Egyptian Isis (so ancient history relates) were represented in their statues as having the thorax and abdomen well covered with supernumerary mammæ, and were thereby supposed to typify *Nature*, the mystic mother of all things that have life. History also relates that a third breast on the person of the unhappy Anne Boleyn so enraged the unsympathetic Henry VIII. that by nothing short of her death could his anger be assuaged.

Supernumerary mammæ are usually pectoral, less often abdominal, and are still more rarely met with on the thigh, shoulder, or back. A single additional breast is commonly met with below one of the others; if a pair exist, one may be found in each axilla; when a third extra one is added, it is found in the neighborhood of the umbilicus. They rarely if ever actively functionate.

Many supernumerary nipples are mistaken for moles or nævi or spots of molluscum. Lichtenstein believes that some variation of this kind is to be met with once in about five hundred persons. Bruce thinks that many are never reported, and that they are relatively quite frequent. The real nature of such a mark may only be revealed by accident or by pregnancy. They oftentimes lack areola, or papillæ, or hair-follicles.

According to Meckel, the earliest types of our species were provided with five mammæ—two pectoral, two axillary, and one near the navel in the middle line. Five seem to have been the largest number noted in any recorded case save one, Gorré having seen one woman with five

[1] *Notizen*, 1839.

breasts thus distributed, while Santerson has reported the case of a male with five nipples in corresponding positions. Alexander has recorded the case of a male mulatto with *six* nipples in whose family there were many such defects. When we recall the widely varying positions in which the mammæ are found in various vertebrates, we shall be less surprised to find one reported on the shoulder of one individual, the groin or thigh of another, or even on the back, since Lichtenstein quotes two of these latter—one reported by Paulinus, the other by Helbig. Handyside has spoken of three brothers each of whom had four breasts.

Sometimes a supernumerary breast will have no nipple, but its secretion will ooze through the skin; sometimes a breast, either in its proper place or elsewhere, will be supplied with two nipples. Fitzgibbon[1] has recorded the case of an individual with double symmetrical nipples on each side, the extra pair being below the others and toward the middle line. Once in a while the extra nipple seems to be connected with the main one by a ridge of gland-tissue. As when one breast or one nipple is wanting it is usually the right, so when there is excess of development, and one is added, it occurs almost always on the left side. When one breast is larger than the other, which is not infrequently the case, it is almost always the left. Klebs would explain this by an intra-amniotic rotation of the anterior segment of the fœtus to the left, and points out that congenital defects of the lungs or thoracic walls are more common on the right side than the left.

A considerable number of cases of polymastia have been reported. Puech has collected 77 French cases; in 46 there were three breasts, in 29 four, and in 3 five. Lichtenstein[2] has noted also 105 German cases. There are, as nearly as I have been able to learn, some 15 cases reported in American literature. Together, these make nearly two hundred cases, from which limited number one would naturally infer that the condition is one of great rarity; instead of which we are assured by those who have most carefully studied the subject that variations from the normal number and location of the mammæ are not infrequent, and that the reason so few appear on record is that such anomalies are made known, as a rule, only by accident, and but few of those made known are reported.[3]

Hypertrophy of the nipple alone is an exceedingly rare condition. Murat has put on record the case of a nurse who could not suckle the infant for whom she was engaged, on account of this peculiarity. It

[1] *Dublin Quart. Journ. Med. Sci.*, 1860, xxix. 109.

[2] *Virchow's Archiv*, lxxiii. 2, p. 222.

[3] *Vide* Klebs: *Handbuch d. pathol. Anat.*, p. 1161; and Duval: *Du Mamelon et de son Auréole*, p. 82 *et seq.*, Paris, 1861.

may be too large in diameter or too long. If too large for a puny infant, it may yet answer for an older or larger child.

On the other hand, the nipple may be preternaturally short or small or retracted, without coexistence of active disease. These conditions are more common, and sometimes prevent the child's nursing without artificial aid. The constant suction of a nursing child is calculated to overcome this condition to a certain extent.

Congenital imperforation of the nipple is only a pathological curiosity, and perhaps has never been seen. Its closure by inflammatory processes does not concern us in our present article, since it affects only the nursing child, or the consideration of cysts from obstruction of outlets.

Irregular or Abnormal Secretion of Milk.

The regular function of the breasts appears to be at times awakened in irregular and bizarre ways. There are on record cases where women who have never been pregnant have yet been able to nurse children from their own mammæ. Again, women who have not borne children for many years have, with or without some stimulus, found their breasts refilling with milk. Thus we have record of a woman of *sixty-one* who suckled her grandchild *eighteen* years after the birth of her own youngest child; and Heister has told how a woman was accused of having murdered her own infant because there was milk in her breasts twelve months after having weaned her first offspring. Carganico in 1838 related a case of a woman fifty-nine years old who nursed a grandchild nine months old, though she herself had borne no child for seventeen years, and had passed the menopause ten years (Beigel).

In Baudelocque's *Art d'Accouchement* is mentioned the case of a girl of eight whose breasts secreted milk in consequence of having applied to them an infant. Even from the breasts of newborn children a milk-like fluid has been expressed; and Will relates that an infant of thirty weeks lost milk from its breasts for some time.[1] Kölliker has shown that this is not inconsistent with the anatomical arrangement at birth.

It furthermore occasionally happens that the breasts begin again to functionate in certain cases of uterine and ovarian tumor.

Hypertrophy.

That simple hypertrophy or hyperplasia of the breast may be mistaken for tumor-formation is quite possible; yet that such outgrowth may exist and not have the significance of a neoplasm is undeniable. It is certainly, however, a rare affection. According to Cooper, it is a

[1] Beigel: *Die Krankhtn. d. weibl. Geschlechtes*, 1875.

disease of middle or advanced life, while Gross held that it generally began at an early period. The latter had opportunity to observe a well-marked case in the person of a colored girl of seventeen, one of whose breasts weighed as much as fifteen pounds. Still more remarkable cases than this have been observed: in a solitary instance it is said that the breasts reached the knees, drawn out of all semblance of mammæ by their weight and tension. Cases have even been recorded where the weight of the breasts in the erect position was intolerable, and where by pressure they interfered with respiration when in the recumbent posture. Huston mentions a breast which was *one meter* in circumference and weighed 8500 grammes. Durston speaks of a case in which one breast weighed sixty-four pounds. One alluded to by Jourdan had a large deep furrow in which the arm rested. Beuvin and Monteils have recently published the case of a girl of sixteen whose mammæ were conspicuously hypertrophied; after marriage and several pregnancies the enlargement had notably diminished. Probably with each lacteal engorgement there was enough vascular excitement to cause absorption of connective-tissue elements, or it occurred with the involution of the gland.

Labarraque[1] collected 26 cases, of which only 5 were over twenty-six years of age. The integument of young women has more contractility and strength to resist distortion than has that of the old. When such enlargement occurs in girls at or near puberty, there is usually more or less disturbance of the menstrual function, sometimes even suppression. In this case the voice is commonly changed, becoming harsher and more masculine.

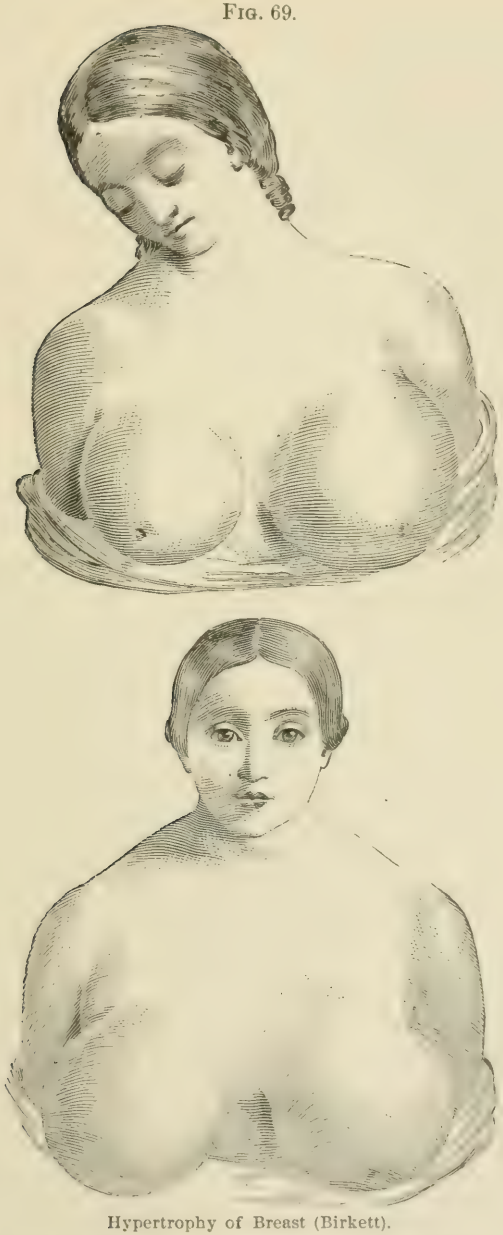
The overgrowth may involve one breast or both; when both are implicated it is seldom to the same extent. Frequently as their size increases the general health of the individual begins to suffer, and the most marked instances have been noted in very emaciated patients.

The anatomical arrangement of the constituents of the simple hypertrophied breast in no wise differs from that of the natural bosom, either in nature or in arrangement. No reference is here made to adenoma nor retro-mammary lipoma, nor the *corps fibreux* of Cruveilhier; only to that condition of multiplication of all the histological elements of the breast *en masse* in nearly their normal proportion. Any conspicuous alteration of the latter would place the growth in the category of tumors proper. It has been known to some as *elephantiasis*, and indeed Virchow has described two varieties which he has termed soft and hard elephantiasis. He has also spoken of a febrile form, in which the enlargement takes place rapidly and is accompanied by general febrile disturbance with local signs of hyperæmia. (*Vide* Acute Engorgement.)

As a rule, the condition is painless, at least up to the time when the

[1] "Hypertrophie générale de la gland mammaire." *Thèse de Paris*, 1875.

Fig. 69.



Hypertrophy of Breast (Birkett).

weight of the parts causes unbearable tension; nevertheless, once in a while a neuralgic or irritable condition is noted. It has been attributed by different authors to deranged menstruation, excessive venery, blows, etc., the variety of ascribed causes attesting the uncertainty attending our knowledge of its etiology.

Diagnosis is not difficult, the only conditions resembling it being lipoma and cysto-sarcoma.

Treatment.—In the way of treatment, calomel, tartar emetic, emmenagogues, and purgatives have been commended by one or another. A fair trial may be given to these or to any drugs which may appear to be indicated, but they are not likely to do much more than to act as placebos. When the breasts become a nuisance, as they do sometimes, the only relief is excision—an operation which the advances of the day have robbed of its terrors. It is seldom a dangerous operation in any case which justifies it, and in such cases, where there is no necessity for further dissection for removal of affected tissues, may be advised with a feeling of perfect confidence.

Atrophy.

When all possibility of further functionating has passed away the breasts undergo an atrophy from disuse akin to senile changes elsewhere. This subsidence commences usually with the menopause, and the organ frequently so completely withers away that only the atrophied nipple marks its former location, especially in those women in whom it has always been small. In married women who are sterile the gland may shrink to quite small proportions, as it may, too, in those who have offspring which they have not nursed.

Certain drugs are said to induce atrophy, such as conium and iodine. It is sometimes noted that the neuralgic or irritable breast undergoes an early atrophy—an anticipated senility, as it were.

If atrophy in young women can be traced to a recognizable cause, it may be possible by removal of the latter to check the former. Massage of the mammary region may stay its course, just as much handling of the breasts in girls leads to their earlier development. Otherwise the condition must be recognized as permanent.

Diseases of the Nipple and Areola.

Of the various skin diseases, eczema is by all means the most common. It is easily recognized, is usually as amenable to treatment as eczema of other localities, and calls for about the same applications. In mild cases the dusting on of a little bismuth subnitrate or protection by a plaster spread with one of the oleates is to be recommended. In severe cases a rigorous search must be instituted for any source of constitutional irritation; the urine should be carefully examined for evidences of a gouty vice; the condition of the *primæ viæ* fully ascertained, etc. The majority of cases will be found to depend on insufficient elimination of urea, associated with a more or less deranged

digestion. For such cases appropriate internal remedies, with exact regulation of the diet, must be associated with local astringents or sedatives.

Next most common of the skin affections probably is psoriasis. This, too, is easily diagnosed, being likely to be mistaken only for a syphilide. The diagnosis will be largely aided by the presence or absence of concomitant signs of lues; still further so if one remember that when the scales are scratched off from the syphilitic lesion there is a little bleeding; when from the non-specific, there is none.

It would seem that other superficial lesions of the parts are so seldom dissociated from similar trouble elsewhere that their consideration can be dispensed with here. Further discussion of specific disease is also postponed.

Ulcers and fissures—which latter are only linear ulcers—are the result in the vast majority of cases either of syphilis or lactation. Vidal has compared them to the excoriations occurring in cases of balanitis. But ulcers may occur as the result of uncleanliness, abrasion, caustic drugs, or an innocent skin disease—*e. g.* pemphigus. If already healthy, they need only the simplest treatment; if irritable, they must be cauterized or in some way converted into healthy sores. Local anæsthesia by cocaine will easily permit such conversion.

Abscess limited to the region of the areola is once in a while met with. It probably arises as a folliculitis of one or more of the small sebaceous follicles found thickly dispersed here. Inflammation once begun in so limited a region can commonly be easily checked by the application of either prolonged heat or cold; if not, a small collection of pus may result. This will be superficial, and should be opened so soon as recognizable: the incision should be in the line of a radius directed from the nipple as a centre; a few strands of catgut or a tent of some kind will prevent the too speedy closure of the little wound.

Excoriations, fissures, and abscesses, such as those mentioned above, are the commonest causes of erysipelas and lymphangitis.

Hyperæsthesia.—The nipple is naturally one of the most sensitive spots of the entire integument, but its normal sensibility may be rendered painfully acute as an accompaniment of some inflammatory affection or as a sign of a neurotic or erotic disposition. Sometimes when such a nipple is rudely touched there occurs a spasm of all the contractile elements in the breast, which is momentary, but quite painful (*thélothisme* of the French writers).

Injuries; Hemorrhages.

Contusions of the breast are common. About the milder forms we need say nothing. Of the more severe forms we will simply refer to

the liability to formation of extensive ecchymoses or even traumatic hæmatoma. Ecchymoses vanish in due time—more rapidly when a lotion of ammonium chloride is applied—and most hæmatomata will undergo absorption. But local inflammation may run high, a general mastitis supervene or abscess form. The possibility of a submammary hæmatoma must be borne in mind. Such would carry the whole mamma forward and cause it to appear to be set on a species of base.

The consequences of contusion are usually of short duration; still, they are in bad repute, since they are so often the alleged precursors of malignant disease. The most effective prophylaxis will be, obviously, enforcement of proper rest and continuance of proper local treatment. If a collection of blood be not in due time absorbed, it would be good practice to incise, and thus get rid of it, since blood-clots here, as in the brain or elsewhere, often undergo cystic degeneration.

Burns of the breast, either from steam, hot water, or fire, in no respect differ from those of other parts, and are to be subjected to similar treatment. Recent experience has shown that a *saturated* solution of sodium bicarbonate makes as soothing an application to a raw burn as anything that has been devised.

Incised, punctured, and gunshot *wounds* in this region have but few peculiarities. By a large incised wound a number of milk-ducts may be divided, and a part of the breast be thereby so interfered with as to undergo subsequent atrophy. The elasticity and contractility of the parts will make a small wound gape widely. Again the ribs, or even the lungs or the intercostal vessels, may have been wounded through the breast. If attention to the deeper parts were urgently needed, one need not hesitate either to enlarge the wound or to include the breast in a large skin-flap, and by dissection of the retro-mammary areolar tissue to lift it up off the ribs, restoring it, and suturing it down after meeting the other indications.

Gunshot wounds which involve the breast alone entail little danger if properly treated. To be sure, the nipple has been so far destroyed by accident as to sadly impair or remove all further usefulness of the gland. Such an accident might in rare cases justify extirpation of the entire gland.

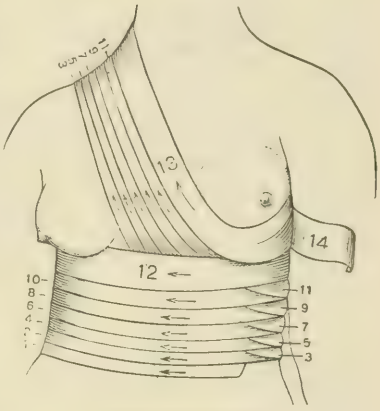
In the treatment of all these traumatisms the writer not only advises that they be subjected to scrupulous antiseptic measures, but he must assume that the reader is thoroughly qualified to carry them out. This granted, the treatment comprises complete hæmostasis, removal of all irritating matter or foreign bodies, neat coaptation of wound surfaces, proper provision for drainage, abstention from all probing or other interference in gunshot wounds unless imperative, and suitable occlusion or dressing.

For the rapid union of wounds it is essential that proper dressings

should be properly applied. The accompanying engravings (Figs. 70–72) taken from Leonard's *Manual of Bandaging*, show some of the best methods.

By vicious cicatrices the nipple, or even the mammæ, may be so distorted or interfered with as to make future physiological function insufficient or impossible. If escape of milk from the nipple were impossible, it would be much better to remove the gland than to permit cystic dilatation of the ducts. But such cases must be extremely rare. From such cicatrices also keloid might arise. Keloid limited to the breast itself might be disposed of by removal of the part, but ultimate cure must always be doubtful in such cases.

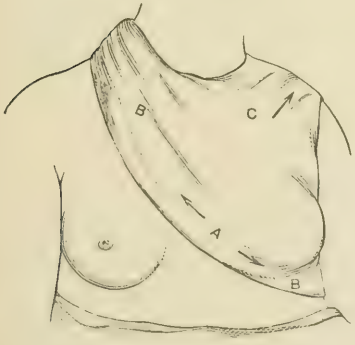
Fig. 70.



Cross of One Mamma.

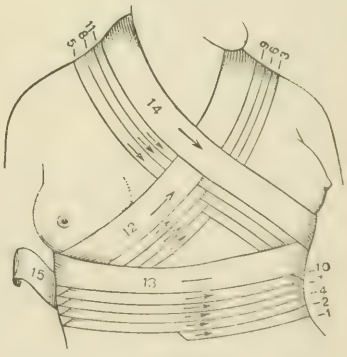
Foreign bodies may also be met with in the breast. Thus, Vidal has related a case in which he was led into an error of diagnosis, his mis-

Fig. 71.



Triangular Bandage applied to the Bosom.

Fig. 72.



Cross of Both Mammæ.

take being rectified when he withdrew from a supposed tumor an ordinary sewing-needle, of the possibility of whose presence the patient claimed to be utterly unaware.

Calcareous concretions are also very rarely found in the breast: Gross has met with them twice. These correspond with the so-called milk-stones much oftener met with in the udders of animals, and are probably the result of a calcareous degeneration—a species of petrifaction—of previously existing products of inflammation and obstructions.

Gross states also that he once met with a cyst in the breast whose walls were calcified. (*Vide* also Chronic Mastitis.)

Spontaneous hemorrhages, sometimes called *apoplexies*, occur in rare cases without suspicion of injury. Naturally, most of these are expressions of a vicarious menstruation, and they may be normal or abnormal for the particular individual. They are most common at the time of puberty, and rarely continue long. Now and then they are met with in adult life, mostly in women suffering from amenorrhœa or dysmenorrhœa. They are usually preceded by a sensation of weight, fulness, and heat, which subsides as bleeding continues.

When purely a vicarious menstruation, it should be permitted to occur without attempts to check it. Only in case it becomes excessive or alarming are hæmostatic measures indicated; then compression with cold applications, and perhaps ergot internally, will be called for. In most of these cases the blood escapes from the nipple, but true hæmatoma may form and in no wise differ from that caused by injury. Ecchymosis—*i.e.* subcutaneous hemorrhage—may be the only evidence of a vicarious flow. It, too, is usually preceded by neuralgia and causalgia of the part. General systemic derangements are common accompaniments of such lesions.

There is also known an absolutely spontaneous hemorrhage which has nothing to do with the menstrual epoch. It seems to be excited by emotion or the hysterical condition, and in all probability is a true apoplexy of the breast. In this case we may have to deal either with a hæmatoma or a hæmatorrhœa. Absolute quiet, with ice and an elastic compress, will meet the indications in such a case.

Acute Engorgements.

Le Dentu and Verneuil have described cases of acute engorgement of the breast with a certain induration (*sclérème phlegmasique temporaire*), occurring particularly in elderly women, which last for a few days or weeks and then subside. Little or nothing of the real pathology of the complaint is known. Some of these cases had gouty arthritis at the time, and that there may have been some mutual relation between the two conditions is more than probable.[1] Indeed, Verneuil insists on this view.

In his large treatise Cruveilhier has alluded to acute œdema of the breast or simple œdematous hypertrophy, but he connects this rather with the consequences of a local phlebitis and erysipelas. Virchow would completely separate from such a specific œdema that caused by non-specific lymphangitis (*leuco-phlegmasia, phlegmasie blanche, hydrop-*

[1] *Bull. de la Soc. de Chir.*, 1874, p. 600.

sie pituiteuse), which in no clinical respect differs from a similar condition in any distensible tissue.

Le Dentu, however, insists that between such a tumefaction as Virchow describes and the condition manifested in his own cases there is a wide clinical difference. In most of his cases the mammary engorgement was coincident with the disappearance of certain uterine troubles. When we recall how inflammation follows the experiment of temporarily compressing an artery and then releasing it again, it is not fanciful that such a tumefaction may follow some reflex spasm of the vessels supplying the mamma; moreover, considering the intimate sympathy between the breast and the uterus, such a spasm may well have a uterine cause. Considering, too, the extreme blood- and lymph-vascular richness of the part, such an explanation seems to be more than a mere hypothesis.

In the *Ephémérides des Curieux de la Nature* there is related, according to Berard, the "remarkable example of prodigious and sudden swelling of the breasts" observed in 1704 in a woman of twenty-nine. Previously healthy and regular, she washed her feet just as one of her periods was terminating. Immediately the catamenia ceased and her breasts became the seat of pain and swelling, so that in the morning she was unable to rise or move in bed. It continued till she was bled freely from each foot, when within three days the mammæ returned to their proper size (Birkett).

Ferrus has reported something similar in connection with a malarial fever. Most of these fulminating engorgements seem to have occurred in young women. The size said to have been attained, in rare instances, by one or both breasts is almost incredible.

Acute Inflammatory Affections.

Pathologically, if not clinically, we can distinguish the following acute inflammatory lesions in the breast:

Mammary adenitis;
Mammary periadenitis;
Mammary cellulitis;
Mammary angeio-leucitis, which is usually the specific lymphangitis known as erysipelas;
Retro-mammary cellulitis.

At the outset, however, one must say that either of these occurring in the non-puerperal state, or without some such specific cause as syphilis, tubercle, lepra, actino-mycosis, or malignant pustule, is quite rare. That is to say, the mammary gland when in a condition of physiological activity is easily inflamed and disturbed, but when in a state of repose it is not prone to acute processes. Nevertheless, as the effect of

the extension of other inflammation, or as the result of traumatism, or as excited by absorption of irritating or poisonous substances through abrasions, or, lastly, as a sequel of the acute infectious or exanthematous fevers and of general septic processes, the virgin or quiescent breast may develop all the signs and consequences of acute inflammation in other parts. Such a condition is occasionally met with in the newborn and at or near the commencement of puberty; the latter, of course, can be easily explained as the consequence of the natural physiological hyperæmia carried to excess. This variety is likely to be subacute rather than acute; swelling is then at its maximum with a minimum of pain, and, inasmuch as the swollen lobules then can be felt under the external tissues, it must be looked upon rather as a mammary adenitis.

But, just as the periosteum usually "sympathizes" when its underlying bone is inflamed, so, once given an inflammatory process taking origin, say, in the gland-structure proper, the surrounding tissues are almost sure to take part in the vascular and other disturbances; and so, as above remarked, it is not often that these finer distinctions can be made at the bedside. The inflammatory process takes about the same course as in other parts of the body, and its further study as such belongs rather to textbooks on pathology. One may say that, in theory at least, there is a point up to which resolution is possible, and that after this is passed either suppuration or tissue new-formation (chronicity) is inevitable. In practice one finds that this point is placed on a sliding scale, and that the index of this scale is in large degree the index of the patient's general condition. But this holds true of threatened phlegmons elsewhere.

We consider it superfluous to rehearse here the subjective and objective features of mastitis. Occurring in the non-puerperal state, its course is, as a rule, slower and less painful than that of the puerperal cases. The inflammatory foci are more likely to be circumscribed. The same may be said, in parenthesis, of mastitis in the earlier months of pregnancy.

The writer would say here that he is in fullest accord with those recent researches by which it appears that while hyperæmia, and even diapedesis, may be purely matters of vascular disturbance, yet when they are continued and merged into pus-production their consideration is inseparable from a study of the action of the micro-organisms by which they are provoked, and without which clinically they never occur. To this conviction he has been forced both by a study of the labors of others and by his own laboratory investigations. But the consideration of the numerous evidences which compel this belief are out of place in this connection and cannot be here considered.

When mastitis first arises measures looking toward resolution may be

at once established. Individually, the writer prefers hot poultices, feeling that these materially hasten the process whichever way it may terminate. He has also found benefit from a mercurial or compound iodine ointment applied to the surface in connection with continuous poulticing. Internally, laxatives, sedatives, and, if necessary, antipyretics (preferably antifebrin), are indicated.

When the usual signs indicate the presence of pus, the sooner it is evacuated the better. The attendant may, if he choose, convince himself of its presence by means of the hypodermic syringe. Once located, it should be evacuated by an incision so made as to correspond to a radius of the circle whose centre is the nipple, in order that little or no danger may be done to the milk-ducts or the lobules. If the abscess be multiple, so must be the incisions. Each cavity ought to be washed out and drainage properly provided for. If the abscess be large, especially if it be retro-mammary, the opening should be made at the most dependent part, so that drainage may be favored by position, while free counter-opening with through-and-through drainage may be called for. Under such measures success is usually speedily obtained. A metastatic abscess is but a local expression, of course, of a grave general condition, and its prognosis is therefore included in that of the more serious disease. General anæsthesia is seldom required for these incisions; local analgesia is secured by cocaine injections or the freezing spray.

Retro- (or post-) mammary abscess is in no wise different from the other forms, but it pushes the whole breast forward in a significant manner. It has been known to perforate an intercostal space and evacuate itself into the thoracic cavity. There is, therefore, great need for both early recognition and early incision.

Erysipelas.

For present purposes it will suffice to briefly consider this topic. Primary erysipelas of the breast is rare; as an extension from affection of neighboring parts it may be met with at any time. It is now known to be an infectious disease of specific nature; further, that the streptococcus which causes it propagates itself by preference along the lymphatic vessels: we have, consequently, to deal with a specific lymphangitis, superficial or deep. As the disease becomes more marked the cocci are not confined to the lymphatics, but permeate to the finest interspaces. Thus, when an abscess results, as it easily may, we are to regard it as a local necrosis of tissues whose life has been sacrificed to the excessive growth of these micro-organisms. According as the trouble is confined to the skin or extends to the proper tissues of the breast its gravity may be slight or severe. Even after the skin over a

large area is involved, recovery by resolution of the specific inflammation and death of the cocci is still possible. The cocci are limited to the skin by a barrier of inflammatory products as by a sanitary cordon, and are disposed of by the leucocytes which are now, in word as in deed, *phagocytes*. But when this has not happened the deeper tissues seem to offer less organized resistance, and then an abscess is pretty sure to follow. Fig. 73 shows the vessels around the acini plugged with

FIG. 73.

Vessels Plugged with Cocci in Erysipelatous Skin (Billroth).

zoogloœa masses of cocci. Thus obstructed, they can no longer carry the proper amount of nutriment, and hence tissue death naturally ensues.

For the erysipelatous dermatitis of the mammary region or of any other part the writer prefers the following as a local application to anything he has ever used:

℞. Naphthalin (in crystals),	5.	
Ichthyol,	35.	
Lanolin,	60.	M.

For the naphthalin an equal amount of resorcin may be substituted. This to be gently rubbed into the affected surface and around it from two to four times a day. In numerous cases this has given prompt and gratifying relief. Next to this Barwell's plan of applying white-lead paint is perhaps most satisfactory. Experiments with a 5 per cent. trichlorphenol solution in glycerin have not yielded results com-

parable to the effects of naphthalin. Internally, catharties, quinine, etc., according to the tastes or prejudices of the physician. I have never been able to convince myself that, so long as erysipelas remains a local disease, benefit is to be gained by any internal treatment beyond a laxative or an occasional sedative, unless some complication coexist.

But when the specific process is deep, and consequently serious, then there is need for supporting, and even stimulating, treatment. Then, too, suppuration is imminent, and should be hastened by poultices, always persevering in the local treatment by antiseptics, as above recommended. When pus has formed the case is to all intents and purposes one of abscess, *plus* the specific nature of the pus and débris to be evacuated, which the attendant will do well to bear in mind.

Very lately a few adventurous pathologists have ventured to suggest making practical experiments based upon the well-known fact that malignant ulcers and tumors have been known to disappear after an attack of erysipelas. Working on this basis, Fehleisen and others have deliberately inoculated a hopeless cancerous ulcer of the breast with a pure culture of the streptococcus erysipelatis. A severe attack has been thereby induced, and after recovery a marked improvement has been noticed in the ulcer. A discussion of all the theoretical points involved in these cases cannot be permitted here; the hint is thrown out for what it may be worth.

Chronic Mastitis.

A chronic inflammation not preceded by one of an acute or subacute nature is, in theory at least, out of the question. So, too, is it in practice, save in those cases which are due to a specific irritant like syphilis or tubercle. Since these cases are to be spoken of by themselves, we have here only to consider those which are perpetuations of acute forms. It is a well-known axiom that chronic—*i. e.* long-continued—inflammation leads to tissue-production, and this usually in the form of fibrous and connective-tissue hyperplasiæ. In the breast this is manifested to the eye more often by contraction than by swelling, and to the finger always by a sense of induration which may be diffuse, circumscribed, or multiple. Such cases may be much cleared up if one can get a history of precedent trouble, such as hemorrhage, contusion, or abscess. A present induration must be distinguished from an acute adenitis of one or more lobules, cold abscess, gumma, cyst, and malignant or benign tumor. Sometimes the diagnosis is easy; sometimes it may only be made by a process of exclusion.

Fig. 74, from Billroth, gives an idea of what changes atrophy and induration may together effect. The connective tissue increases, but so much pressure is made on the gland-structure proper that it disappears;

as a consequence, the volume of the breast is decreased. In case of previous abscess-formation this condition of chronic inflammation may be combined with the existence of one or more fistulæ. The condition corresponds perfectly with that described in 1838 by Velpeau as *induration en masses*, and by Sir Astley Cooper in 1845 as *chronic mammary*

FIG. 74.

Combined Effect of Atrophy and Induration.

tumor. Although, when seen, it may have nothing to do with the puerperal state, it is rare in those who have not been pregnant. At times it is accompanied by great pain, at others it is almost painless.

Marcus Beck speaks[1] of a chronic lobular interstitial mastitis of one or more lobules, occurring most often in women near the menopause, and most common in those who have borne children. It frequently gives rise to severe neuralgic pain, aggravated at the menstrual epoch. A hard nodule is felt, firmly imbedded in the gland-substance, but without adhesion of overlying structures. Under the fingers it gives a sensation as of leather, rather than as of stone. After it has reached a certain size the disease becomes stationary, the pain usually subsides, and no further trouble is experienced. Several such lobules may be felt, and both breasts may be thus affected.

Quite recently Phocas has described these nodules at length under the title *maladie noueuse de la mamelle*. He speaks of two forms—that subsequent to abscess, which appears in women advanced in years; and that of spontaneous origin in younger women. The latter he ascribes

[1] *Heath's Dictionary of Surgery.*

largely to compression from corsets and to menstrual derangements. According to Phocas, the commencement of the disease is often slow and insidious; the patient discovers by chance that she has an enlargement of the breast, but often also pain is the first symptom to appear. When the disease has reached its full development there is almost nothing to be seen except a very slight deformity. On examination from before backward one almost always finds a movable, distinct tumor, whose size varies from that of a hazelnut to that of a large walnut, whose consistence is firm and resisting. Superficially situated, it is in general separated from the skin by a small quantity of soft tissues, and is of the mobility of adenomata, to the extent of being capable of displacement from two to three fingers' breadths in all directions, offering the sensation of a foreign body in the gland. But further exploration shows that this tumor is by no means isolated; at a greater or less distance from the principal tumor there exist a large number of other prominences, separate from one another by small intervals. The size of these nodosities varies from that of a pinhead to that of a pea. Their consistence is the same as that of the principal tumor. That which distinguishes them specially from the principal tumor is their perfect connection with the mammary gland. If one takes the gland between two fingers, one can quickly determine that all these little prominences are an integral part of the gland, which is, one might say, sclerosed, especially in its upper third, where one finds a quantity of these nodosities, which are disseminated irregularly in the substance of the breast. One might imagine that he had pricked a great number of pins into its substance, and could feel the heads through the skin. As to the principal tumor, its mobility is not absolute; it is limited by a pedicle which it is usually possible to find on searching across the tumor, but it has no connection with the skin. As to functional signs, they are reduced to pains, very variable according to the case, but which in some circumstances are so intense as to constitute one of the forms of the disease which has been described under the name of irritable tumor of the breast.

The course of the affection is fitful. There are alternations, oscillations, in the volume of the tumor; its termination may be by spontaneous recovery or by treatment which consists in compression; and it is the disappearance of these tumors which has led to the belief in the cure of cancer by certain forms of treatment.

There are also cases which one might call "*frustes*" (incomplete), in which the tumor exists alone, without being accompanied by those little nodosities which give its particular character. These are the cases which are most difficult of diagnosis. This is based especially upon the fact that the *maladie noueuse de la mamelle* succeeds in certain cases to abscesses, and in others is the result of a known irritation; that on

palpation it is composed of a principal tumor, mobile but pediculated, accompanied by a multitude of little disseminated indurations in the thickness of the breast, which contract intimate connections with the gland; that it is often bilateral; that it advances in an irregular fashion and by jumps, and finally terminates favorably. But in the incomplete form—that is, without the nodosities and fibromata—the resemblances are such that the diagnosis becomes very difficult, and so that one may ask if there is not an identity of nature between benign tumors and this form of mammitis. These tumors would be only a more advanced state of the affection which it is important not to misunderstand, since in this case all operative measures are contraindicated.[1]

In the matter of treatment, in simple cases one should try those measures which are known to benefit chronic inflammation in other parts. Among these the so-called sorbefacients deserve a certain amount of the repute in which they are held. Among these perhaps two deserve special mention: these are mercury and iodine, and they are most efficient when they are rubbed up with lanolin as a vehicle, by which their absorption is very much promoted. The effect of the combination is still further heightened when a small proportion (15 per cent.) of ichthyol is added. A 10 per cent. oleate of mercury ointment, made up with lanolin and ichthyol, or a 2–4 per cent. iodine ointment in the same vehicle, will produce as much effect as any remedy of this class can. Perfect freedom from local irritation should be ensured and the general condition of the patient attended to.

But a mamma thus affected, which is always troublesome, and which does not become at least comfortable after treatment, or which is evidently beyond it, is to be viewed with the same suspicion as attaches to a man known to be a thief. It is well known that malignant degeneration may supervene at any time, especially as the menopause approaches, and consequently the best interests of the patient *may* dictate operation—either total removal of the breast or excision of the painful nodule. The attendant risks are now-a-days so slight that they may be almost disregarded in the face of the resulting benefit. This is in consonance with a general rule which make it advisable to remove any accessible organ or portion of the body which has become functionless, intolerable, and a source of future risk.

One incidental feature or consequence of chronic inflammation, so rare as scarcely ever to find mention, is the formation of calcareous nodules in the breast, apart from their occurrence in a true neoplasm. In the mammæ of the canine race they are not rare, but in our species they have been met with exceedingly infrequently. Gross has twice met with such cases in elderly women. Bassius—so says Morgagni—met

[1] *Courier of Med.*

with a collection of calculi in the mamma which gave forth a sound on shaking the breast. Rufus, Levinius, and Lemnius have cited cases; so have Bonnet, Morgagni, and Cooper. Berard met with a calcareous condition of the entire breast; but as his description was written in 1812, before either our terminology or our anatomical knowledge was as exact as it is now, we are left in doubt as to whether it was a true calcification of a chronically inflamed breast or an enchondroma or osteoma. At all events, Velpeau places no high degrees of credence upon Berard's report.

These chalky masses lie sometimes in the connective tissue, sometimes in the milk-ducts, where they remind one of phleboliths. The latter are to be viewed as we view salivary calculi: of the former we are not in position to speak with certainty. Of themselves, they do not necessarily call for removal. When connected with tuberculous processes they are to be included in their proper category of tuberculous products. If atheromatous in origin, their significance is lost in the more important underlying general disease.

Quite recently Heudoupe has put on record the following case:[1] He was consulted by a woman of thirty-five for what she called an abscess of the breast. There was a large, irregular ulceration on the upper part of the left breast, from which creamy pus freely escaped. The cavity of the abscess was three-quarters filled by a hard tumor which gave a sensation of porous stone to the probe. The part was benumbed with a spray of ether and the calcareous mass was removed. It was about the size of an egg. The antecedent history of the woman was as follows: At the age of fifteen she hurt the left breast in a fall. A painless tumor the size of a nut developed in the breast. The woman married and had two children, which she nursed. She noticed the secretion of milk was always more profuse from the diseased breast. Four years before the calcification was removed another traumatism to the breast occurred, and an abscess developed which was opened, and a fistulous tract was left which persisted.

Mammary Fistulæ.

These are the remains of previous suppurative lesions, and mean either that the case was insufficiently or improperly attended to earlier in its course, or that the pus-tracts and drainage-outlets are prevented from healing by some diathetic condition, usually syphilis or tuberculosis, or both. In case of multiple mammary abscess mistakes are sometimes made in not making incisions freely and numerously. The peculiar structure of the breast permits burrowing of pus, and it happens once in a while that the gland becomes riddled by pus-tracts.

[1] *Gaz. des Hóp.*, Aug. 25, 1887.

Unless, now, each of these be, at the time of opening the abscess, sought out and laid open, a fistula may result. The tuberculous or cold abscesses when not early recognized are prone to work their way toward the surface and thus provide themselves with vents. A cavity thus emptying itself in time contracts till it is in effect a fistula.

Empyæmic collections of pus have been known to escape from the thorax and present thoracic fistulæ behind or at the margin of the mammæ. Lastly, caries of the ribs may cause a collection of pus and débris which may come to the surface in the same location.

In all cases the cause of the fistulæ must be first traced, and then the effort to remove it made. Thus a breast which is shrunken and riddled with sinuses had better be removed. Individual sinuses may be treated as are rectal fistulæ—*i. e.* freely slit up. In connection with those of long standing one need not hesitate to incise freely, since by their presence they have probably already caused obliteration of those ducts which one might otherwise hesitate to cut across.

If the case be one of empyæma, it is in no sense gynecological, and should be turned over to the general surgeon. So too when caries of an underlying rib is the prime cause; and here, again, it may be possible to lay up the breast and remove the source of the trouble without sacrificing the gland.

In all cases, whether tuberculous or not, the operator should never content himself with simply incising such a passage; it should be thoroughly scraped with a sharp spoon until bleeding tissue is reached in every direction. Only by this means can all source of possible future trouble be removed. As will be seen, with the milder treatment by injections, etc. the writer has no sympathy save in the simplest possible cases. When a fistula connects with an enlarged milk-duct or lobule, it had better be also completely extirpated or obliterated.

Tuberculosis mammæ.

This is a subject very sparingly handled, or even barely mentioned, in the ordinary textbooks, and the paucity of its literature is obviously caused by the indifferent information we have concerning it. In 1881, however, appeared Dubar's monograph, *Des Tubercules de la Mamelle*, comprising a summary of what little had been previously published, in connection with his own very careful studies and examinations. To this the writer, like every other student of the subject, must acknowledge his indebtedness. Other very instructive articles by Ohnacker, "Die Tuberculose der Weiblichen Brustdrüse,"[1] and by Le Dentu, "Tubercules de la Mamelle,"[2] will well repay perusal.

Certain it is that very few cases have been accurately observed.

[1] *Archiv f. klin. Chir.*, 1883, xxviii. 366.

[2] *Rev. de Chir.*, 1881, i. 27.

That which Sir Astley Cooper spoke of as "scrofulous tumor of the breast" was undoubtedly one of the manifestations of tuberculosis, just as is every decided "scrofulous" tumor. What Velpeau described as tubercles in the skin over the mamma were probably disseminated cancerous nodules. Nevertheless, he described three manifestations of tubercle in the breast: *a. Tubercules disséminés; b. Tumeurs lymphatiques; c. Tumeurs lymphatiques purulentes.* After Velpeau, Nélaton[1] and Bérard[2] paid scant attention to the subject, and Johannet in 1853 wrote his thesis upon the subject.[3] So Cornil and Ranvier were quite wrong in saying, in their *Treatise on Histology*, that "examples of tubercles in the breast are unknown," though Cornil has since written of tuberculosis of this gland. Klotz published also a brief article in 1879.[4] Kolessnikow has described a form of necrotifying interstitial mastitis of cows as one of the local manifestations of *perlsucht;*[5] and something of the same kind is probably to be met with in rare cases in our own species. In his work on *Diseases of the Breast*, Billroth also gives an excellent summary of what has been learned of this condition.

One thing in this connection is absolutely certain, and that is that many cases of this nature are overlooked entirely or are confused with other local conditions from which they ought to be clearly separated. The better, therefore, that the condition is understood, the sooner can this separation be made—a matter of no small importance in the patient's interest.

The commonest manifestation of mammary tuberculosis is to be met with in cold abscesses and chronic fistulæ. Aside from these we have to deal with disseminated tubercles and tuberculous gummata or infiltrations. Infection *in loco* having occurred, the disease takes much the same course as in the lungs. Multiple true tubercles are formed, having as their foci giant-cells, and these foci may for some time remain separate or they frequently coalesce, and then we have the confluent form. To these succeeds caseation, with liquefaction in one case and calcification in another, or they may undergo atrophy, and so spontaneous cure ensue.

In the disseminated form the breast is but slightly augmented in size, and is quite movable over the ribs. On section a variable number of nodules are met with, of various sizes, of yellowish-gray color or with yellow centre surrounded by a grayish zone somewhat pearly in appearance. The surrounding tissue has a pretty natural appearance, though slightly firmer than natural. Under the finger the nodules are somewhat hard, but friable, sometimes presenting a soft-

[1] *Thèse d'Aggregation*, 1839. [2] *Diagnostic differential des Tumeurs du Sein*, 1842.
[3] "Diagnostic des Tumeurs cancéreuses et tuberculeuses du Sein," *Thèse de Paris.*
[4] *Archiv f. klin. Chir.*, Bd. xxv. [5] *Virchow's Archiv*, Bd. lxvii.

ened interior. In other words, they tend slowly to caseous degeneration, and by acting as irritants tend to cause consolidation of adjacent tissue. Bauchet has gone so far as to ask whether the subsequent calcification of these masses may not be mistaken for osteoma. The microscopical appearances are consistent with the grosser changes thus far mentioned.

In the confluent form the swelling is much more marked and is unsymmetrical. Near the point of greatest swelling fistulæ will be often found. The nodules can be felt to be irregular, bosselated, rather immovable, while the less affected parts of the breast are felt to be studded with nodules. On section there are found irregular cavities and passages, the latter all leading into or out of the former and often communicating with the exterior. The cavities and sinuses are lined with the so-called pyogenic membrane so significant of tubercle; and this may be covered, here and there, with granulations of an unhealthy appearance. It has an average thickness of a line, and can be stripped off from its attachments. The balance of the mammary tissue is indurated, pale, fibrous in aspect, corresponding much to the appearances of fibroid phthisis. It is more or less studded with fine nodules consisting of miliary tubercles. While this may be regarded as a more advanced stage of the previous form, it yet represents the disease as we oftenest recognize it.

A true miliary form may, probably does, exist, but is not yet sufficiently known to bear description, most likely because patients presenting it are not seen sufficiently early—*i. e.* they have passed the miliary stage by the time they apply for treatment.

In the disseminated form the nipple is scarcely altered in appearance. By palpation, rather than inspection, are the various indurations perceived. Their number is in inverse proportion to their size. Most of them will have a size about that of an almond; they have a certain mobility while yet fixed in their beds, and are quite firm and solid. There is little or no accompanying pain. The progress of the disease is very slow, while considerable periods of time may elapse without any advance. Their termination is uncertain: sometimes they disappear in whole or in part. Sometimes a cold abscess forms, and they are thus disposed of. According to Billroth, they may persist through life without much change.

With the confluent forms it is hardly so. They pursue a steadily unfavorable course, and by fusion of separate foci form larger masses by which the volume of the breast is considerably augmented. All this may go on without noticeable inflammatory reaction; in more acute cases, on the other hand, there are general and local febrile disturbances, decline of appetite, pain, and tenderness. The pain is sometimes even lancinating and radiating. Lymphatic glands in the axilla

and neck may be involved, and the whole clinical picture may much resemble an acute onset of malignant trouble. Distinct tumors may be felt, and the skin over the incipient tuberculous abscess may have the characteristic appearances. The neighboring surface will probably be bosselated, the particularly suspicious tumor but slightly movable, giving on palpation an uncertain or indefinite sense of fluctuation. Exploratory puncture may yield pus or fluid débris. If the foregoing signs are met with in connection with existing fistulæ, the evidences of tuberculosis are indubitable.

Cold Abscess.—From such tumors as those made by the confluent form of mammary tuberculosis above described cold abscesses of the breast are formed. Besides these must also be included those which have an empyæma or a carious rib as a cause. Our knowledge of this class of pus-collections is now so definite that we may say a cold abscess is always a tuberculous abscess. While such purulent dépôts are commonly found in connection with the scrofulous diathesis, we may yet meet with them in patients who show no other sign of existing tubercular disease, and who are apparently very far from phthisis. In fact, they only make stronger the constantly-accumulating evidence that tuberculosis, like most cancers, is, at first at least, a local affection, and therefore curable in proportion to its accessibility.

While there may be room for doubt in the case of supposed tubercular nodules in the breast, and differential diagnosis may call for a high degree of ability, the recognition of a cold abscess should ordinarily be very easy. If doubt still remains after eliciting the history and examining the part, the exploring trocar will clear it up. And if the character of the fluid be still doubted, the microscope will speedily disperse the doubt. A search for the distinctive tubercular bacilli may not be rewarded with success, since the pus may be so old that its pathogenic organisms have died and disintegrated; still, they are often to be found.

Of the conditions which are capable of conducing to tubercular disease, three only deserve mention—viz. trauma, pregnancy, and lactation. Trauma can only be a factor when it calls forth a low grade of chronic inflammation. The other conditions conduce to extensive structural changes and peculiar activity, and their influence must be quickly appreciated. In one of Ohnacker's cases the disease began while the patient was in the puerperal state; in one of Le Dentu's, a breast in which the disease had apparently almost completely subsided was seriously disturbed by subsequent pregnancy.

It would seem to be a matter of the gravest import that mammæ thus involved should not be put to physiological use again. All possibility of infection from nursing mother to suckling infant should be

obviated. Kolessnikow's researches above alluded to make clear this possible source of danger.

With respect to treatment of tuberculosis of the mammary gland there is but little to be said. Palliative treatment will comprise adequate protection from irritation, such sedative or sorbefacient applications as the practitioner may have faith in, and such general constitutional treatment as may be indicated. The only efficient and radical treatment is extirpation of the entire gland, with removal of any affected axillary glands. This may be regarded as final and curative. If any fistulæ have tunnelled into the surrounding tissues, they should be either dissected out or thoroughly scraped, since they are as tuberculous as is a cold abscess, and need just as severe treatment.

Lupus of the Breast.—Inasmuch as the preponderance of evidence is now in favor of the tubercular nature of lupus, and inasmuch as a great majority of cases of lupus of the skin and mucous membrane are certainly manifestations of local tuberculosis, this is a suitable place in which to allude to the possibility of its occurrence, though very rarely, around the nipple or on the breast. Its pathology, etiology, and general appearances in no sense differ from those of lupoid lesions of other parts. The essential features in its differential diagnosis, along with particular details concerning the above, are so fully and frequently treated of in surgical and dermatological literature that, having alluded to its appearance, they would be superfluous here.

The treatment consists either in complete curretting of the affected surface or else exsection of all the involved tissue.

Explanation of Plate III. (from Dubar).

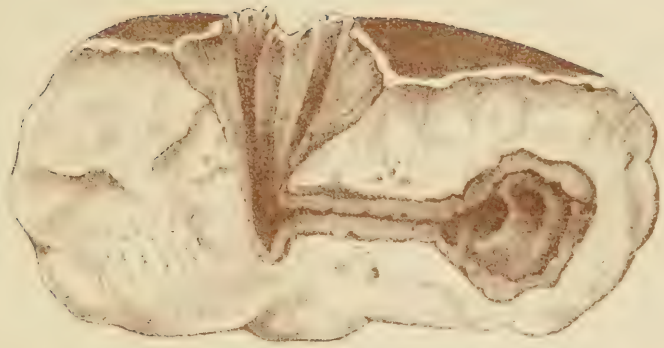
Fig. 1.—Section of a Mammary Gland, showing the lesions of confluent tuberculosis: *A*, fistulæ communicating with the central cavity, *C*; *B*, diverticulum from same.

Fig. 2.—From the immediate neighborhood of *C* in Fig. 1: *A*, section of lobule, showing a few ducts still preserved, the balance being lost in the cellular infiltration; *B*, giant-cell; *C*, caseous nodule. × 60.

Fig. 3.—Section made at a distance of 3 cm. from the foregoing. Lobular infiltration much less distinct. At *A* and *B* are seen the ducts, whose identity is not yet crushed out by the proliferating cells surrounding them. × 60.

Syphilis of the Breast.

Primary Syphilis.—*Chancre.*—While not in any sense a disease of lactation, chancre of the nipple and areola is more often found, in this country at least, upon nursing mothers or wet-nurses than under other circumstances. For example, an infant presents, recognized or unrecognized, evidences of inherited syphilis, usually mucous patches. The nurse, having already some fissure or abrasion of the nipple, acquires the disease by immediate contagion. It is possible for the mother also to thus acquire primary syphilis from her own child with-



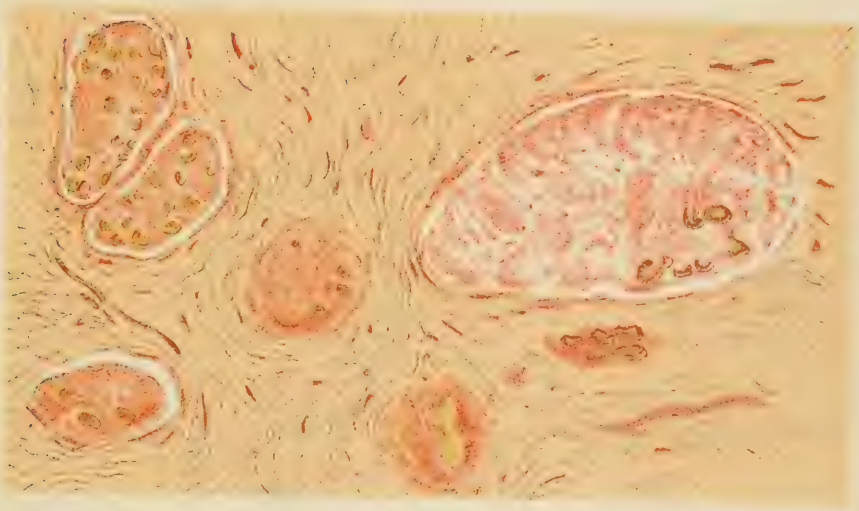


Fig. 2.

Section of a Mammary Gland showing Lesions of Confluent Tuberculosis.

out violating Colle's law, though at first it might be regarded as an exception. Such a case proves, according to Hutchinson,[1] a striking support of it, since it shows that when the mother has not yet suffered from it—*i. e.* has been protected—she may yet contract the disease from her own offspring.

Aside from chancres thus acquired from nursing infants, they may be contracted from the buccal lesions of a lover or by some mere accident without depravity.

Those acquired from infected children may present "large, deep, indurated ulcers, brawny excavations, excoriated or ulcerated indurated fissures, or flat mucous papules more or less livid, moist or dry, scaly or scabbed, sometimes but little indurated" (Keyes). Indeed, Fournier has published one case with seven papules on one nipple and sixteen on the other.[2]

The DIAGNOSIS must be made upon the history, the general appearance of the chancre, the induration of its base, the axillary or cervical adenopathy, and perhaps the results of confrontation. If in doubt as between chancre and chancroid, the test by auto-inoculability may be tried. Furthermore a few weeks' time will clear up the matter if a chancre exist, since secondary symptoms are not likely to be long delayed.

Implication of adjacent lymph-glands is an almost invariable feature of primary specific disease. In the case of chancre of the breast these will be found enlarged in the axilla and above the clavicle. Sometimes the inflamed lymphatics can be plainly felt underneath the skin like fine cords, or can be traced by the color lines caused by the accompanying perilymphangitis.

After the healing of the chancre and the subsidence of the adenopathy the site of the primary sore is likely to be long marked by an induration.

The chancre itself needs only the mildest local treatment, but the patient should be at once placed upon a prolonged course of mercurials in some shape.

SECONDARY SYPHILIS is most frequently met with in the form of mucous patches and moist papules. The secretions from all secondary lesions are very infectious; and, if the raw surface of the former be irritated its discharge may become so far auto-inoculable as to get a pustule or an ulcer somewhat resembling a chancroid, while the discharge from a moist papule causes another. In fact, any syphilitic papule may be converted into a mucous patch if subjected to heat and moisture. Hence under large and pendulous mammæ, or in the case of exceedingly obese women, a good place to look for surface indications of syphilis is beneath the overhanging breast.

[1] *Syphilis*, p. 119.

[2] *Gaz. des Hôp.*, Dec. 1, 1877.

The discharge from all these moist lesions is in every respect as infectious as that from a fresh typical chancre.

Besides these there are the ordinary forms of pigmentary and other syphilides which may be seen on the breast as well as elsewhere. The polymorphism of these manifestations is notorious.

Fournier has shown that anæsthesia or analgesia of the breast is an occasional manifestation of the late secondary stage of the disease.

Along with the surface manifestations there go the implication of the lymphatic glands, and perhaps the faucial hyperæmia, the elevation of temperature, or the evidences in the patient's irides,—all of which will be noted by the careful attendant at the first examination.

Tertiary Syphilis in or on the breast is marked either by the development of rupia, ecthyma, or late mucous patches externally, or internally by a so-called syphilitic mastitis, which is inseparable clinically from the formation of syphilomatous new-formations or gummata. These seem to have been alluded to by, among the first, Boissier and Sauvages, under the name *cancer vérolique des glands mammaires*, but which, as we now know, have nothing about them of a cancerous nature. Our best information concerning gumma of the breast is summed up by Landreau in his thesis published in 1874.[1]

According to Lanceraux, two distinct forms of specific mastitis are to be recognized—*diffuse* and *circumscribed* or gummy. The former is marked by an indolent swelling without change in the color of the skin, accompanied by axillary adenopathy, with little or no pain. It is usually bilateral. The latter, better known, comprises the existence of gummata, either subcutaneous or in the tissue of the gland. They are slow in growth, indolent, frequently discovered by accident, firm, bosselated, and usually without enlarged axillary glands. Later, little by little, the tumor softens in its interior, becomes more adherent to its overlying skin, which latter takes on a deeper hue, and then ulcerates through and discharges a débris. After this evacuation, even without much treatment, the parts heal with a deep, circular scar, pale at its bottom, copper-colored around its margin. On account of their rarity gummata are frequently mistaken for malignant tumors. In one case Richet was led into this error and prepared to extirpate a breast, but just before making the operation found, by accident, a tumor in the patient's calf. This made him pause and hesitate; then he gave up the notion of operating, and put the patient upon potassium iodide; after a short time both tumors disappeared.

In the matter of differential diagnosis it is enough here to simply remind that a patient with gumma of the breast will, in all proba-

[1] "Sur les syphilomes mammaires," *Thèse de Paris.*

bility, present some other evidence of specific disease or it will appear in the history of the case.

Cases of gumma have been described by Yvaren, Maisonneuve, Verneuil, Ambrosoli, Hennig, Marin, Biercher, Landreau, Cheever, Boeck, Lang, and others.

According to Hennig, an induration, or even a gumma, may occur in the breasts of those who are victims of hereditary syphilis.

In regard to TREATMENT little need be said here. Mercury, externally, internally, sometimes almost eternally, and preparations of iodine in the later stages, constitute our main reliance in these cases. Certainly not in our generation will be found any remedies which shall supplant them in professional esteem. One kind thing may always be said of syphilis: that while its *neglected* effects yield to no morbid conditions in point of disgustingness and horror, there is no other disease in the entire list which yields with so much certainty to the *judiciously* directed action of remedies as does syphilis to the two above named.

It seems, moreover, to be now clearly established that syphilis is *curable*, at least in most instances, and that consequently hope can be held out for all who have time, patience, and the good-fortune to be in proper hands.

MASTODYNIA; NEURALGIA OF THE BREAST; IRRITABLE MAMMA; MAZODYNIA (Birkett).

This is an excessively annoying, sometimes severely painful, affection, of which much is seen clinically and but little known pathologically. For convenience it would perhaps be well to divide these cases into two classes: those in which no structural alteration can be perceived, and those in which the presence of a nodule or an indurated lobule, or of a small subcutaneous tumor, can be made out. To this class belong those cases which Sir Astley Cooper has spoken of under the heading *irritable tumor of the breast.*

If the term "neuralgia" implies that we are ignorant of the cause of a given pain, then the cases in the first category may be with propriety considered as neuralgic: something is at fault, but just what we do not know.

In the second class of cases there is some change discoverable on palpation; this may be some small neoplasm or a localized or diffused chronic inflammatory process. It is not difficult to believe that some nerve-fibrils have been so caught in the new growth or entangled in the inflammatory tissue-change as to be pressed upon, and thus give rise to pain, just as does an inflamed dentine or a carious tooth. To

prove this may be difficult, but to assert it is to keep within the bounds of reason.

In either class the symptoms are about the same. The part, always tender, will ache for some hours after handling, the sensation not being confined to the breast, but radiating to the shoulder, arm, and side. In bed the weight of the breast is intolerable, and the patient cannot lie on that side. Causalgia is a frequent complaint, and the pain is sometimes like that of tic-douloureux. When the pain is most severe there is frequently nausea. Sometimes corsets cannot be worn or the clothing has to be specially arranged. In some cases light pressure over the points of exit of the middle and anterior branches of the intercostal nerves causes intense pain (Birkett). In almost every instance the pain is aggravated before and during the menstrual period. Patients thus affected are usually tortured by fear of cancer; and this fear, preying upon their minds, is calculated to aggravate their condition.

With patients in Class I. we find, on examination, nothing save extreme tenderness, which may be localized or diffused, or may indeed be noted in each bosom. Patients of Class II. will present either small, movable, sensitive nodules, in almost every instance fibromata or adeno-fibromata, or will give unmistakable evidence of a chronic lobular interstitial mastitis of one or more lobules. No matter how much pain is complained of in the shoulder, no enlargement of glands is detected in the axillæ.

These patients have almost invariably passed the age of puberty; some will have passed the menopause. They are usually of an hysterical or neurotic disposition; many of them are erotic. Previous lactation, with subinvolution as physiological activity subsides, is the apparent cause in some. Others will ascribe their troubles to injury; in many no satisfactory cause can be assigned. One of my patients, a young woman, had such irritable mammæ that she could scarcely dress comfortably; the slightest accidental tap upon her bosom would almost make her faint. She was extremely erotic, had been a confirmed masturbator, and had had uterine and vesical disease.

I had occasion to remove a small adeno-fibroma of the breast in the case of a young woman who complained of excessive pain and radiating disturbance. In spite of local anæsthetics, the pain of operating was bitterly complained of. Pain persisted long after its removal, to finally subside; but for years after the scar, now slight and perfectly movable, was and still is the centre of an area from which radiates constant discomfort and often distress. She has uterine displacement, and is of an erotic temperament, her struggles to subdue the latter seeming to augment the mammary distress.

A lady came two hundred miles to see me with the fixed purpose of having me remove her left breast, supposing that she had cancer, and

having arranged all her affairs to that end. I found slight evidence of a low degree of chronic diffuse inflammatory disturbance, but there was only little change to note on comparing the healthy breast with the painful one. I sent her directly home again, with directions as to her hygiene, diet, etc. and an iodine-and-belladonna ointment for local use. I saw her several months later and she was quite relieved in body and mind.

A maiden lady consulted me, complaining bitterly of a painful nodule in one breast. I learned that in another city a physician had withdrawn by aspirator an ounce of colorless fluid from a cyst, and that the nodule she complained of was the shrunken remains of that cyst. The pain was, as usual, out of all proportion to the apparent gravity of the case. She could not lie on that side at night, nor wear corsets nor use the corresponding arm. In the course of a few months the nodule entirely disappeared under but little treatment, and her pain vanished with it.

These are illustrative cases of what is frequently called neuralgia of the breast. No such pain as these patients complain of is felt in any malignant tumor so early in its course or until it is plainly and conspicuously malignant, and the very excess of suffering and of tenderness is the significant feature of the neurotic cases.

These cases are by no means rare. In four years, for instance, Velpeau saw 40 of these neuropathic affections of the breast; in 21 the right breast was affected, in 17 the left, and both in 2 of them. Of these women, 15 were under thirty years of age, 7 between thirty-one and forty, 8 between forty-one and fifty, 7 between fifty-one and seventy, and 3 were over seventy. In 10 some slight induration was found; in the balance he could discover no alteration.

Many of these cases are doubtless reflex neuroses, the primary trouble being sometimes in the digestive and assimilative organs or in the gouty diathesis, and sometimes in the pelvis. Menstruation is usually deficient or deranged.

TREATMENT must be directed to removing the cause if possible; if this be impossible, then it must be tonic and symptomatic. A painful nodule had better be removed. A purely hysterical case needs moral and mental treatment as much as physical. An erotic female, if single and otherwise ready for it, may be safely advised to marry, and pregnancy will probably put an end to her mammary neuralgia. In certain purely neurotic cases the actual cautery may be applied with benefit or an ignipuncture may be advisable. Sedative ointments oftentimes palliate if they do not cure. Rectification of a uterine displacement will give great relief. Overcoming intestinal atony and relieving hepatic engorgement, as indicated by the existence of hemorrhoids, etc., will practically cure some of these cases. Swinging up pendulous neural-

gic breasts in a sort of suspensory is of great advantage. Massage, salt-water bathing, the constant current, faradism, systematic exercise, etc. will be indicated in many cases.

Finally, the breast, like the neuralgic testicle, is only to be removed as the last resort in patients who have resisted every treatment and as to the genuineness of whose symptoms there can be no doubt. I can imagine a case which might justify removal, but have never personally known of one, though Birkett speaks of two instances of this kind.

Sympathies of the Mammæ with Other Organs.

It is made in many ways to appear that the mammæ are in strong sympathy with the pelvic viscera. Many women with ovarian or uterine disease complain bitterly of the mammæ, and we know how many cases of mastodynia are afflicted with some pelvic disturbance. Many women have irritable mammæ before or during each menstrual epoch, and many young girls approaching puberty have more or less engorgement or tenderness of the breasts. Some women confess that any handling of or toying with the mammæ, even by one of their own sex, will arouse strongly erotic desires. Quite recently Dr. Strong of Westfield, N. Y., has recommended the application of mild mustard sinapisms to the breasts to hasten a retarded menstrual flow, claiming to have been rewarded by success in numerous instances.[1]

It is quite possible that the clinical fact that diminution in size of the breasts is now and then noted after a sharp attack of mumps may have given rise to some of the disrepute into which that disease has fallen, since many of the laity believe that it often leaves patients of both sexes sterile or impotent.

There may be added, perhaps, that the breasts constitute notable hystero-genetic centres, pressure upon or irritation of which in susceptible subjects may call forth the various phenomena of hystero-epilepsy, at times in mild degree, at times to the full extent.

[1] *Med. Press. West. N. Y.*, March, 1886, p. 259.

FISTULÆ.

By EDWARD W. JENKS, M. D., LL.D.,

Detroit.

Definition.—By the term "fistula," when applied to the genital organs of woman, we understand a solution in the continuity of the utero-vulvar canal, resulting in the establishment of an unnatural communication between these organs and a neighboring viscus, tube, or cavity.

Etymology.—Taken in its classical signification, the Latin *fistula* indicates a reed, a flute, a pipe; that is, a hollow instrument of greater or less length. It needed but a slight modification of its meaning, however, to make it expressive of a morbid condition in which the fluids of a part passed through an unnatural channel to the free surfaces of the body, and it was early used in that sense. In its practical and clinical use the idea of length as a qualifying factor has been lost sight of, the term being as readily applied to simple orifices which directly connect a viscus or cavity with the exterior as to long and sinuous channels.

The two great divisions of Fistulæ we have to consider are the urinary and fecal fistulæ, the former giving exit to the urine through the vagina, the latter to the contents of the bowel.

Urinary Fistulæ.

History.—The operation for the cure of fistula is of recent date, and among the many achievements of modern surgery this may be ranked as one of the greatest. Sufferers from these affections, debarred from the society of family and friends and obliged to lead a cheerless, despondent life of isolation, are now by the triumph of surgical art restored to health and happiness.

A search in the writings of physicians of antiquity is barren of results. Apparently they had no idea of urinary fistulæ as found in women, though it would seem that the disgusting nature of the malady ought to make its existence evident to an ordinary observer.

Hippocrates, indeed, does speak of a flow of urine following diffi-

cult labors, but the terms used and the method of original treatment advised refer to a simple incontinence of urine rather than to its escape by a fistulous opening. The reason of this deficiency in the ancient records of pathological conditions has been attributed, on the one hand, to the supposed rarity of fistulæ in the women of that day, the customs and manner of living rendering them but little liable to these accidents of childbirth; and, on the other hand, it is alleged that fistulous openings may have been of frequent occurrence, but were unobserved because the practice of midwifery was entirely in the hands of midwives. Hippocrates lays down the precept to relinquish the lying-in to the care of women, and to reserve to men the more difficult obstetrical operations. This custom prevailed for a long time, and even as late as the beginning of the seventeenth century Bartholini wrote that the art of midwifery was *infra viri dignitatem*, and that men disdained to apply themselves to it.

Whatever may have been the cause of this omission on the part of medical writers, it is probable that fistulæ were not rare before the discovery of forceps, since physicians then had no control over difficult labors, nor means of terminating them in cases of exhaustion.

We find no mention of urinary fistulæ until the time of Ambrose Paré in 1570, who proposed a method for the closure of vesico-vaginal fistulæ. Van Roonhuysen[1] of Amsterdam was the first, however, in 1660, to devote himself to finding a method for the radical cure of these affections. He laid down correct surgical principles and described clearly the details of the operation. According to him, the woman must be placed in the position for lithotomy upon a table, the vagina widely dilated with a speculum, the edges of the opening vivified with a knife or scissors, touching the bladder as little as possible, and united by strong pins of sharpened goosequills about whose ends thread was wound. How far successful this eminent Dutch surgeon was in his treatment we are in ignorance, as he left no record of his cases. This much, however, is certain: that he was the first to give an intelligent method of removing one of the most afflictive infirmities of the human race, and a method which contains many of the germs of the modern operation.

Mauriceau in 1712 looked upon the condition as incurable by operation. If recent, a cure was possible by introducing cicatrizing medicaments into the vagina and retaining a catheter in the bladder for several days.

Voelter in 1720, after freshening the edges, united them by interrupted silk sutures inserted by needles and needle-holder: the sutures were tied in a knot and a catheter used.

[1] Hendrik van Roonhuysen: *Heelkonstige Aaumerkingen betreffende de gebrekken der vrouwen*, Amsterdam, 1663.

Fatio in 1752, following the plan of Roonhuysen, succeeded in causing incontinence for a time.

Petit in 1790 confined his attention to the proper care and to the introduction of the catheter and use of a urinal. It will thus be seen that the eighteenth century passed without material change or progress in the treatment of these lesions from that in the time of Roonhuysen.

With the beginning of the present century began a new era of activity in the treatment of fistulæ.

Desault[1] in 1804 laid down two rules—to oppose the passage of urine into the vagina by introduction of a catheter in the urethra, and to approximate the edges by vaginal tamponing. Both methods had been previously used, but Desault so modified them to fulfil the conditions required that he may well be considered the originator. He used a large-sized catheter retained by a specially contrived truss-like apparatus. The vaginal tampon consisted of a rounded finger-like body of lint coated with wax and pressed into the vagina. With the slight modifications of the vaginal plug the method of Desault was generally approved and adopted by such men as Richter, Clarke,[2] Barnes,[3] Guthrie,[4] Blundell, and others. Soon, however, a violent reaction set in against this method, and the use of both the catheter and vaginal plug was severely criticised.

While this discussion was going on, Lewzinski in 1802 again proposed the interrupted suture, and in 1812, Naegele[5] tried to return to favor the ideas of Roonhuysen and his successors. He freshened the edges with a knife or scissors, and coapted them by means of interrupted thread sutures: he also used with silver or gilt pins a twisted suture. This practice was followed by Schreger[6] in 1817, who placed the patient upon the abdomen, scarified the edges with scissors, and united them with interrupted silk sutures; by Ehrmann, who made use of the dorsal position, trivalve speculum, scarification of the edges after the insertion of the interrupted suture, and the catheter: at times he also practised cauterization of the edges with a mineral acid. Deyber,[7] a contemporary of Ehrmann, indicates a new bivalve speculum calculated to depress the posterior wall of the vagina.

[1] P. J. Desault: *Traité des Maladies des Voies urinaires*, Paris, vol. iii.; Chopart: *Traité des Voies urinaires*, 1821, vol. i. p. 448.

[2] *Observations on those Diseases of Females which are Attended by Discharges, etc.*, London, 1821.

[3] *Med.-Chir. Trans.*, vol. vi.; *Gaz. des Hôp.*, 1837.

[4] *Edin. Med. and Surg. Journal*, 1818 and 1823.

[5] *Erfahrungen und Abhandlungen über Krankheiten des Weiblichen Geschlechts*, Mannheim, 1812.

[6] *Annal. des chirurg. Klinikum auf die Univ. zu Erlangen*, 1817.

[7] *Essai sur les Fistules urinaires-vaginales* (Inaug. Thesis), Strasburg, 1827.

In 1825 and 1827 a new method of treatment was introduced in France through the experiments of Lallemand,[1] Dupuytren, and Delpech. Lallemand[2] in 1825 applied nitrate of silver to the edges of the orifice, and when the eschar had separated brought them in apposition by means of a *sonde-erigne:* of 15 cases treated, 4 are reported cured. Dupuytren and Delpech used the actual cautery with modifications of the coapting instrument, and report a few cases as cured. The authors of this method of cauterization hoped to so modify the edges of the fistula by inducing inflammatory swelling that with the aid of mechanical approximation and contracting powers of the "inodular tissue" of Delpech they would succeed in closing, or, at the worst, in reducing the size of, the opening.

Owing to the severe attacks made by eminent surgeons, confidence was lost in this method, and it was largely abandoned. To show the confusion of ideas and practice at this time, the case of a woman may be cited who was successively treated by all the known methods by Morrison, Liston, Witther, and Syme.

Roux[3] of France in 1829 made use of the abdominal position and speculum, pared the edges, and united them with silver pins and the twisted suture.

Malagodi[4] of Bologna (1829), having failed with nitrate of silver, resorted to the method of suture and kept a catheter constantly in the bladder.

Dugès[5] of Montpellier in 1831 treated an unsuccessful case of Lallemand's by freshening the edges with curved scissors and a narrow bistoury and uniting them by curved needles and waxed thread. The threads were tied by a knot and a catheter introduced into the bladder. At the end of three days, owing to a severe hemorrhage, the sutures were removed, and the operation necessarily proved a failure.

Fabbri in 1830, modifying somewhat the plan of Malagodi, obtained a success. He also devised some instruments for freshening the edges and approximating them by suture.

In 1832, Vidal de Cassis[6] introduced a new method by closing the orifice of the vagina and making a common urinary receptacle of the vagina and bladder. He freshened the surfaces of the labia majora and united them by sutures to get complete union.

Gosset[7] of London in 1834 gave an account of a successful case

[1] *Arch. gén. de méd.*, 1825, vol. vii.

[2] Roche et Sanson: *Nouveaux Éléments de Pathologie médico-chirurgicale*, Brussels, 1829, vol. iv.; Deroubaix: *Traité des Fist. uro-gen. de la Femme*, Brussels, 1870, p. 40.

[3] *Journal hébdomadaire*, 1829, vol. iv.

[4] *Raccoglito medico*, July, 1829; *Arch. gén. de méd.*, vol. xxi.

[5] *Gaz. méd. de Paris*, 1831, Nos. 44 and 367.

[6] *Traité de Pathologie externe et de Médecine opératoire*, 5th ed., 1855, vol. v. p. 54.

[7] *Lancet*, Nov. 21, 1834.

treated by the following method: the patient was placed in the knee-elbow position, the perineum drawn up with a speculum, the edges of the fistula carefully pared, curved needles passed with a needle-holder, and the opening closed by uninterrupted sutures of gilded silver wire kept in place by twisting. An elastic catheter was kept in the bladder, and the patient requested to lie on the face to secure perfect drainage.

Beaumont in 1836, after paring the edges, united them with a quill.

Baroni of Bologna freshened the edges with the patient in the knee-elbow position, and united the edges by piercing the mucous surface of the vagina only with silver pins.

Gerdy[1] thought the failures of Baroni and of Rizzoli, who followed the same method, might be due to the small extent of denuded surface. He accordingly dissected a strip from the vaginal surface on each side of the fistula and united it by suture.

Dieffenbach[2] of Germany in 1836 practised several methods, but generally used that of the interrupted suture. He put the patient in the lithotomy position, exposed the fistula with a bivalve speculum, freshened the edges so as to assume a funnel-shaped appearance, and united them with interrupted silk sutures, being careful to avoid the mucous surface of the bladder. The catheter was worn constantly. In spite of the great surgical skill and ingenuity of the operator, his efforts were attended with poor success. On one woman he operated no less than eighteen times with failure, yet so great was his activity and perseverance that a large number sought relief at his hands.

In 1834, Jobert de Lamballe[3] introduced a new method of treating vesico-vaginal fistulæ which he styled elytroplasty or cystoplasty. It consisted in transplanting tissue taken from the labia, buttock, or thigh to the freshened edges of the fistula and fastening it there by stitches. The catheter was worn to ensure drainage. Of 4 cases reported, 1 was cured, 2 failed, and 1 died.

In 1838, Wützer[4] of Bonn practised the following method: the woman was placed upon the abdomen, the perineum drawn back by a hook speculum, and the labia separated by assistants. The edges of the fistula were then seized with a tenaculum and denuded for three or four lines, avoiding the mucous membrane of the bladder. The surfaces were approximated with insect needles and the twisted suture. Wützer adopted the original plan of opening the bladder above the pubes, introducing a catheter, and keeping the patient upon the abdomen to

[1] *Revue scientifique et industrielle*, June, 1841.

[2] *Die Operative Chirurgie*, Leipzig, 1845, vol. i.; Schuppert: *A Treatise on Vesico-vaginal Fistula*, 1866.

[3] *Traité de Chirurgie plastique*, 1849, vol. ii.

[4] *Ueber die Heilung der Blasenscheidenfistela, in Organon für die gesammte Heilkunde*, Bonn, 1843, vol. ii.

ensure the constant escape of the urine. He was more fortunate in his operations than his contemporary, Dieffenbach. From 1838 to 1842 he, according to the testimony of Kilian, cured 4 out of 18 patients—a success which at that time may be considered extraordinary. Up to the year 1852 he had cured 11 out of 35 cases treated.

In 1839, Hayward[1] of Boston reported the cure of a vesico-vaginal fistula of fifteen years' standing which had proved intractable to cauterization and the catheter. The patient was placed in the lithotomy position, the parts dilated, and the fistula brought well into view by means of a large bougie pressing it down from the bladder. He then pared the border of the fistula and dissected from the vaginal surface the tissue to the extent of three lines. By means of curved needles three silk sutures were passed, the denuded surfaces brought into apposition, and the threads firmly knotted. A short silver catheter was placed in the bladder and the patient kept upon the right side. At the end of five days the parts were found united and the stitches removed. Although this method had been practised before in its essential features by Gerdy and Dieffenbach, yet, owing to their failures in effecting a cure, it had attracted but little attention. Hayward showed conclusively the success of the method, and inspired confidence in the curability of the affection. In 1851 an additional series of 8 cases were reported, making 3 cures after 20 operations.[2]

In 1846, Metzler[3] of Prague adopted the knee-elbow position and a polished silver speculum, grooved and somewhat conical, for raising the perineum and reflecting light upon the fistula. He freshened the edges with curved scissors, and extended the denudation for one and a half lines upon the vaginal surface. These surfaces were then united by gilded needles and clamps, and these secured by perforated balls the size of large shot. The catheter was kept in the bladder continuously.

In 1847, Pancoast[4] of Philadelphia succeeded in effecting two cures by a method he called his "plastic suture." The fistula was exposed by a Charrière speculum. The upper lip was split longitudinally for half an inch, and the lower one pared to a wedge-shaped form, drawn into the groove of the upper, and held by sutures. The bladder was drained by an elastic catheter.

In 1847, Mettauer[5] of Virginia published his account of a fistula treated with leaden sutures and catheter after paring the edges. Such was his success that he felt justified in pronouncing all cases of vesico-vaginal fistula as curable.

In 1847, Jobert de Lamballe adopted a second new procedure which

[1] *Am. Journ. Med. Sci.*, 1839.
[2] *Boston Med. and Surg. Journ.*, 1851.
[3] *Prager Vierteljahrsschrift für prakt. Heilkunde*, 1846.
[4] *Med. Examiner*, May, 1847.
[5] *Am. Journ. Med. Sci.*, July, 1847.

he styled *cystoplastic par glissement*. The characteristic feature of this operation consisted in separating the vagina from the uterine neck, so that the fistula could be closed without tension upon the edges, and union thus favored.

Jobert de Lamballe was an exceedingly ingenious and skilful operator, and in the long line of surgeons who have sought to perfect a method of treating vesico-vaginal fistula no one excepting Sims has displayed more inventive fertility, depth of resource, and mechanical dexterity than this illustrious Frenchman. His method, which constitutes what is called the French method, was quite extensively practised by French and foreign surgeons, but is now almost entirely abandoned, because of the eminently superior results which have been attained by the American method, so called in distinction. This last method was presented to the medical profession by J. Marion Sims, then of Alabama, in 1852.[1]

The last half of the nineteenth century began, as we have seen, without any settled method in the treatment of fistula. On the part of eminent surgeons there was a sad lack of confidence in any procedure, a distrust, or even disparagement, of reported cases of cure, and a general belief in the incurability of these affections. To be sure, a few cases of successful treatment were reported from time to time, but they were received with indifference or excited but little attention. The method of Jobert, although the latest and attended in his own hands with some remarkable success, proved a failure for the most part in the hands of others, and consequently was not permanently adopted. All known methods by cauterization, vaginal tampon, coapting instruments, transplanting, and suture were practised by different operators or the same operator in the hope of obtaining a success. The weight of testimony, on the whole, was in favor of the method by suture. The contributions and successes of Gosset, Hayward, Metzler, and others provoked almost no interest, failed to be appreciated, and were barren of results. Such was the aspect of medical science toward urogenital fistulæ when J. Marion Sims made known the result of his experiments and observation and placed the operation for the radical cure of fistula upon a solid and certain basis, so that these lesions were removed from the category of incurables. Criticism was disarmed by success, and room left for no material improvement after leaving his hands in 1857. The discoveries to which Dr. Sims made claim were, first, a means by which the vagina could be thoroughly dilated and explored; second, a suture which could be left in place for a long time without exciting inflammation or ulceration; third, a method of draining the bladder of urine during the period of cure. These were accomplished by, first, the knee-chest position and the use of a speculum in form like that of a

[1] *Am. Journ. Med. Sci.*, Jan., 1852.

duckbill; second, the use of metallic threads secured by leaden clamps; and third, a self-retaining catheter. In 1857, Dr. Sims[1] had modified his operation by substituting the simple interrupted silver suture, secured by twisting, for the clamp suture, and by employing, instead of the knee-chest position, the less tedious semi-prone posture now universally known as "Sims' position."

As has been shown, not only were these essentials of success used previously by many operators, but all three were actually combined by two surgeons—Gosset of England in 1834, and twelve years later by Metzler of Germany. The former particularly described the advantages of the gilt-wire suture as an unirritating agent, and the latter emphasized the importance of thorough distension of the vagina by a speculum combined with position, and described a speculum in its essential features like that of Sims.

Though Dr. Sims was anticipated in the principles and details of the operation, it is unquestionably true, as shown by his writings, that he worked independently of others, and brought to the solution of this difficulty exceptional qualities of mind and great mechanical skill and ingenuity, which enabled him, in the face of almost insuperable obstacles, to carry forward his plan to its successful completion. To him belongs the credit of so combining and modifying operative procedures that they fully met the required conditions, and enabled the surgeon to undertake and promise a cure with gratifying certainty.

To simplify an operation which, with its difficulty and uncertainties, was once the *bête noir* of the most skilful surgeons, so that it is now within the capacity of ordinary operators, is a work whose value cannot be too highly estimated.

Bozeman of Alabama, initiated in the method of operating by Dr. Sims before the latter left the State, introduced in 1856 a device of his own which he called the "button suture." This consisted of a thin plate of lead made to fit the opening. Through perforations in the plate the wire sutures were made to pass, and were secured in place by perforated balls or buttons of lead compressed by strong forceps.[2] Bozeman, by his writings and by his skill and success as an operator, did much to popularize this method at home and abroad.

Almost contemporaneously with the promulgation of Sims' method Prof. Gustav Simon of Germany devised and announced an operative procedure for the cure of vesico-vaginal fistula which in point of success is second only to that of Sims. His first publication (1854) was chiefly concerned with a modification of Jobert's method. After comparing the French and American methods and studying their cause of

[1] "Silver Sutures in Surgery," *N. Y. Acad. of Med.*, 1857.

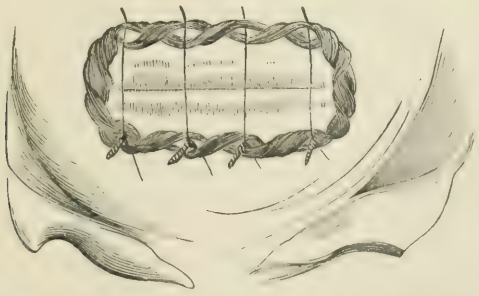
[2] "Remarks on Vesico-vaginal Fistule, with an Account of a New Mode of Suture and Several Successful Operations," *Louisville Review*, May, 1856.

failure and success, he gave his own plan of treatment in 1862. In most respects this is radically different from that of Sims, and those elements of success upon which Sims lays such stress he modifies or rejects altogether.

Simon's method was as follows: The patient was placed in the exaggerated lithotomy position, so that the vulva was well elevated; the fistula was thoroughly exposed by means of a duckbill speculum and retractors; the edges were pared, involving a portion of the mucous surface of the bladder; silk sutures were used to unite the edges, a double row, superficial and deep, being inserted if necessary. No catheter was employed, unless the patient was unable to pass the urine; the bowels were not confined; and the patient was allowed to sit up. Simon also devised a method for complete occlusion of the vagina below the seat of the fistulous opening, called kolpokleisis. The anterior and posterior surfaces of the vagina were denuded just below the fistula and united by sutures, thereby obtaining complete adhesion and closure of the canal.

Since the time of Sims' last contribution, in 1857, many modifications in the details of his operation have been made. Simpson's method of coapting the edges was by means of iron-thread sutures and a wire splint in place of the Bozeman "button." The splint was formed by twisting ten or fifteen fine wires into a cord, the ends of which were fastened together. This was then bent into a shape suitable for the fistula. Holes corresponding in number to the sutures are made by passing an awl between the strands. The iron-thread sutures were

FIG. 75.



Simpson's Splint in Place, wires fastened over the lower bar.

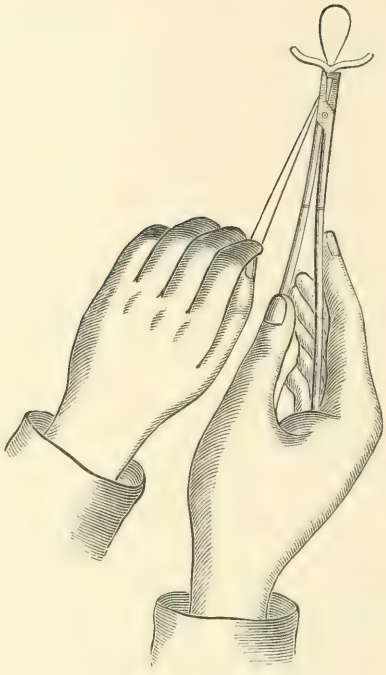
introduced by means of a hollow needle (a modification of Startin's needle); a crotchet and hook were then drawn through the perforations in the splint and twisted with a wire-twister, which was made after a plan suggested by Dr. Coghill. The permanent catheter was used.

I. Baker Brown very early adopted the American methods, and employed first Sims' clamp suture, and afterward Bozeman's button

Fig. 76.

Coghill's Wire Suture.

Fig. 77.



Baker Brown's Method of Fastening Suture.

suture; later he made some modifications of his own. In 1859 he introduced the bar clamps to secure the wires. A separate clamp was placed upon each suture, and fastened by compressing the elevated centre or nipple through which the wire passed. He placed the patient in the lithotomy position, and used straight and angular knives for denudation, and hollow needles for introducing the metallic sutures.[1]

W. L. Atlee described an operation in 1860,[2] which was intended to combine the excellences of Bozeman's and Simpson's methods without their disadvantages. His sutures were of blue-iron wire. As each one was introduced, the end was attached to a thread line to prevent tangling. The edges were approximated before adjusting the plate by traction on the wires and twisting every alternate suture. The button was a lead plate with a long, narrow fenestrum bevelled toward the wound. On each side of the fenestrum was a row of perforations. The twisted ends were brought through the fenestrum and the others through the holes. The former were secured by compressed shot, and the latter by simple torsion with a Coghill twister.

Shortly after Atlee devised another means of coaptation. The edges were transfixed by blue-steel toilet-pins, and over the ends of each pin an elastic ring was slipped. Different-sized rings were obtained by cutting sections of rubber tubing of various diameters. If found

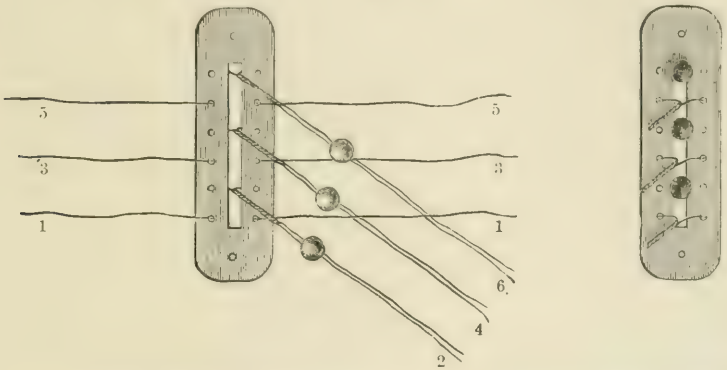
[1] Baker Brown: "On Vesico-vaginal Fistula, illustrating a New Mode of Operating," *London Lancet*, Feb., 1860, and *Surg. Dis. of Women*, 1866.

[2] Atlee: *Amer. Journ. Med. Sci.*, Jan., 1860.

necessary to guard the points of the pins, he recommended that perforated shot be compressed upon them.

In the same year Robert Battey[1] described a device for securing

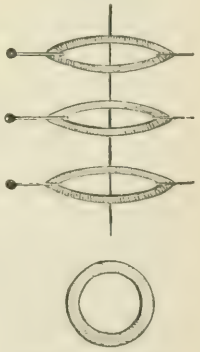
Fig. 78.



Showing Steps in Twisting Suture and Appearance when Completed (Atlee).

sutures, which he called the combined splint and compress. It consisted of a lead plate with perforations for the wires along the upper edge, and corresponding notches along the lower. As the sutures were introduced they were passed through the holes in the plate and fastened by perforated shot. The freshened edges were approximated by traction upon the lower ends of all the wires while they were supported underneath by a thin wooden spatula. Each wire was then lifted into its notch, twisted with the end previously shotted, and cut off at the twist. The advantages claimed for this apparatus are support, compression without strangulation, perfect coaptation of the margins, and a water-tight joint.

Fig. 79.



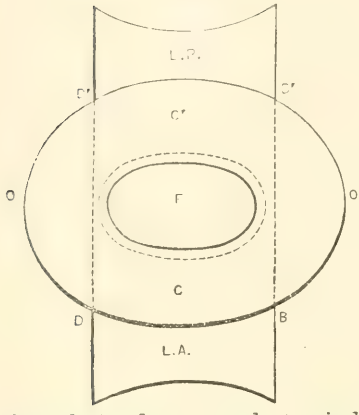
India-rubber Suture.

Collis of Dublin described his operation in 1862 according to Agnew, though one of its salient features, division of the edges, was brought out in 1857 (Deroubaix). Dieffenbach, Hayward, and Pancoast had already employed a method similar to his to obtain a surface for union. Collis split the margins around the entire fistula, and turned each side back, the vaginal upon the vagina and the vesical upon the bladder. Double threads of silk were then drawn in. Through the row of loops along the superior edge a vulcanized quill was passed. The edges were then approximated, and the sutures secured by tying their free end to the other quill.

[1] Battey: "A New Principle of Treatment and Apparatus for Vesico-vaginal Fistula," *London Lancet*, Mar., 1860.

In 1864, Dr. Alfred Meadows[1] advocated before the Obstetrical Society of London the utility of dispensing with the catheter and allowing the patient to go about. He reported two successful cases in which he had employed this negative after-treatment.

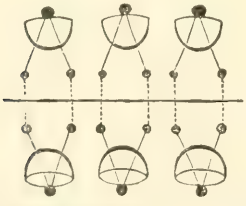
FIG. 80.



Shows the two flaps, L. A and L. P, raised, and the two lateral surfaces, D O D' and B O' B', vivified (Deboué).

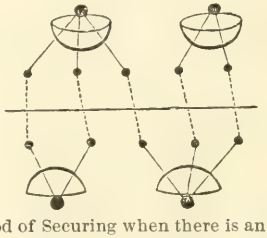
Deboué of Pau, recurring to the ideas of Hayward, Dieffenbach, Gerdy, and Collis, published in 1865[2] a new method by autoplasty or flaps. He dissected back a flap from the edge of the inferior and superior lips (or the right and left if the fistula ran longitudinally), and in large fistulæ denuded the vaginal surface at the angles of the opening. Metallic sutures were introduced. The ends of the sutures on each side were passed through a small double-

FIG. 81.



Ends of Sutures secured, Two to a Button.

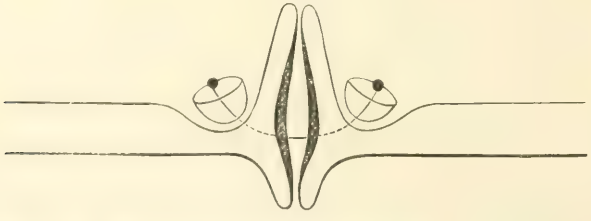
FIG. 82.



Method of Securing when there is an Odd Number of Sutures.

perforated hemispherical button, a pair of ends to a button, to which they were secured. There was, therefore, a row of buttons on each side of the line of union.

FIG. 83.



Section showing the Position of the Split Edges or Flaps when the Sutures are in Place.

[1] *London Lancet*, 1864.

[2] Deboué: *Mém. de la Soc. de Chir.*, 1865, vol. vi. p. 417; also Churchill, *Maladies des Femmes*, 1866, p. 920.

Courty was one of the first abroad, as Sims was the first here, to recognize the superfluity of such accessories as buttons, bars, clamps, quills, splints, etc., and to appreciate the entire adequacy of the simple interrupted metallic suture. The brilliancy of his results shows the wisdom of his conclusion. In 15 cases he had 15[1] cures. His method of operating closely resembles Sims' improved procedure, as set forth by the latter in 1857. He placed the patient in the lithotomy position and used iron-wire sutures, which he sometimes introduced by attaching them to a silk thread, and sometimes by a Startin needle in a holder devised for the purpose. Later, he used Chinese silk.

Etiology.—Among the rarest of fistulæ are those of congenital origin. Several cases have been recorded in which operative measures for their relief were attended with success.

The effective agencies in the production of fistulæ are all those of a penetrating or destructive character which result in a permanent opening through the wall of the utero-vulvar canal. These may directly penetrate the septum, as in wounds from the action of strong caustics, or indirectly do so in consequence of the pathological changes excited in the parts, the order of sequence being impaired circulation, inflammation, ulceration, and local death.

These agencies may be classed as pathological, mechanical, and traumatic in character.

Pathological.—It was formerly held, and by eminent surgeons, that the most common and important factor in the production of these affections was a diseased condition of the parts themselves. As late as the writings of Scanzoni we find this idea given expression to in the following terms: That he had oftenest observed vesico-vaginal fistulæ as the result of cancerous inflammations of the uterine neck, and that "perforations due to difficult labor only come second in point of frequency." Pathological fistulæ are now considered exceptional, and if they occur in connection with malignant growths more frequently than is generally supposed, the hopeless nature and gravity of the primary affections render the secondary of little interest and irremediable.

Fistulous openings may also arise from syphilitic and phagedenic ulceration or from affections seated in the vicinity of the vagina and bladder and accompanied by suppuration. The pus from such an abscess in making its escape may break through the wall of the vagina and bladder and establish an unnatural communication between this canal and neighboring structures, or, if a double perforation occurs, produce a urinary fistula. These abscesses may have their origin in the ischio-rectal fossa, broad ligament, in a periuterine hæmatocele, and tumors of the abdominal cavity. These openings, however, differ from

[1] *Gaz. des Hôp.*, 1865, Nos. 122 and 123; Courty: *Traité pratique des Maladies de l'Utérus et de ses Annexes*, Paris, 1866.

the usual forms in showing a natural tendency to close on the cessation of the discharge. In case of double perforation the urinary is substituted for the purulent secretion, and the opening becomes permanent.

In certain exhaustive diseases accompanied with a greatly depressed vitality of the structures, as in the severe continued fevers, ulceration and perforation of the vesico-vaginal septum may take place. Moreover, a severe vaginitis in the puerperal state may take on a gangrenous character and end in extensive loss of tissue.

Mechanical.—Under this head come those agents which by their shape, position, or long-continued presence in the bladder, vagina, or vicinity excite inflammatory action and produce perforation. Of this nature are objects introduced into the bladder through the urethra; vesical calculi, the nucleus of which may have been some foreign body imprudently introduced; badly-fitting pessaries or pessaries too long retained and roughened by erosion and concretions, cases of which have been recorded by Breschet, Dupuytren, Lisfranc, Dieffenbach, Busch, and others. Sponges, tampons, and foreign bodies of all sorts used with an indefinite purpose are capable of producing ulceration, if not extensive loss of tissue, and complete perforation of the vesico-vaginal septum. Dupuytren reports the extremely difficult removal of a cup-and-ball pessary which had cut its way into both bladder and rectum. The remarkable feature of the case was the spontaneous cure of the two fistulæ following extraction of the pessary.

Traumatic.—These fistulæ result from wounding or compression of the genital canal. The rarer forms of direct injury to the vesico-vaginal septum are angular and pointed bodies in the bladder, a sound or catheter in rough and unskilled hands, wounds from firearms, vaginal lithotomy, puncturing of the bladder during vaginal operations for the relief of vaginal atresia, procidentia, and the like, and amputation of the neck or extirpation of the uterus for malignant disease. Foreign bodies introduced into the vagina for the criminal purpose of inducing abortion may by their violent manipulation result in fistula.

By far the most common and efficient factors in the causation of fistulæ are the circumstances and conditions connected with parturition. These are of such a nature as to cause either laceration or compression of the maternal structures and establish urinary fistulæ.

In a normal labor there is an equilibrium between the expelling and opposing forces; but if, for any reason, these relations are changed, and premature strong uterine contractions come on before the uterine neck is sufficiently dilated to allow of the passage of the head, a tear is likely to occur. Such lacerations in a lesser degree are common, but if extensive may involve the vesico-vaginal septum and give vent to the urinary excretion. Likewise, the natural resiliency of the tissues may be so impaired or lost that they will fail to dilate before the advancing part,

and a tear is the consequence. Such instances are seen in the rigidity of the soft parts in primiparæ of advanced age, or in contractions or morbid changes which have taken place in these tissues.

The conditions produced by laceration establish at once urinary and fecal fistulæ. The majority of fistulæ, however, are caused not by premature and rapid delivery associated with rigidity of the soft tissues, but from the severe or prolonged pressure of the presenting part. In difficult or delayed labors over 90 per cent. of the vesico-vaginal fistulæ are thus produced, according to Agnew,[1] and the statistics of Emmet[2] show, excluding the 23 fistulæ intentionally made in the operation of cystotomy for the cure of cystitis or removal of stone, a majority over all other causes of 95 per cent. The author's experience and the testimony of Sims and other writers are to the same effect.

While the head in its passage through the genital canal recedes in the intervals between the pains—that is, so long as the pressure is intermittent—little harm is done; but when the presenting part becomes impacted and the pressure continuous the maternal structures are in great danger. The resultant, on the one hand, of the opposing wall of the bony pelvis, and, on the other, of the advancing fetal head, is compression of the intervening tissues to such a degree that the circulation is cut off and the vitality of the part is impaired or destroyed. If, then, this pressure is severe, it need be of but short duration, or if prolonged of but moderate severity, to cause extensive loss of substance. Local death occurs, and when the slough separates a permanent opening is found in the adjacent viscus. In less severely contused portions of the septum it is probable that in consequence of the inflammatory and destructive processes excited perforation follows. Ordinarily, except in cases of laceration, the urine does not escape for several days after the delivery. This may be in four or five days, or the existence of such lesion may not be recognized for a month. Petit records such a case. Agnew reports one in which the opening did not occur until the twenty-first day after confinement; Adler of Iowa, one in which the slough had only partially separated after twenty-five days; Emmet gives the average of seventy cases, showing the separation of the slough to take place after the tenth day. The predisposing causes of the lesion are all those of a general or local character which delay or prevent the natural progress of the child. Such are contractions in the bony pelvis, a distended bladder (a condition especially emphasized by Emmet as a factor in the production of these affections), fecal accumulation, vesical calculi, vaginal tumors, rigidity or narrowness of the utero-vaginal canal, anterior obliquity of the uterus, hydrocephalus, monstrosities, malpositions, and the like.

[1] *Laceration of the Female Perineum and Vesico-vaginal Fistula*, 1873.

[2] *Principles and Practice of Gynecology*, 1884.

Bearing in mind the above statements, it follows that whether labor is of long or short duration the continuity of the vaginal wall is jeopardized whenever the pressure becomes continuous. Such conditions of imminent danger require and demand for their relief artificial assistance to the natural efforts, and of those aids the obstetrical forceps takes a front rank in value and efficiency. The use and abuse of forceps have furnished ground for many lengthy and sharp controversies among physicians and obstetrical writers, and the popular belief still holds instruments used in protracted and difficult labors as responsible for all the accidents that happen or disorders that ensue. The great weight of testimony, however, is to the effect that the obstetrical forceps is conservative in its action—that by its aid protracted labor may be terminated, and when timely used the liability to extensive sloughing and the establishment of fistulæ may be averted. In other words, sloughing and fistula of the maternal parts following protracted and difficult labors are more frequently attributable to delay in applying the obstetrical forceps than otherwise.

Anatomical Characters.—As the large percentage of fistulæ have their origin in conditions connected with parturition, their location and variety will depend on the relation of the genital canal to the adjacent structures at the time of compression. It is largely the relative points at which pressure occurs that determine the seat of injury. As a rule, these lesions are found in the median line and at the most common seat of compression, behind the symphysis or in its immediate vicinity. In its natural position the bladder is situated just behind the symphysis, and is therefore most frequently exposed to injury during childbirth, giving rise to a fistula at the base of the bladder. When, however, the bladder is distended, it rises above the pubes, leaving the vesical neck and the urethra to receive the brunt of the advancing head, and resulting in a destruction of the septum at these points. Moreover, when traction is resorted to, and the bladder is already over-distended, laceration of the vesico-vaginal or recto-vaginal septum is especially liable to occur.

Lacerations and sloughing of the uterine neck and vaginal cul-de-sac, in consequence of the force exerted by the fœtal head at the superior strait, may produce a fistulous opening involving the uterus and bladder, or uterus, vagina, and bladder. If the laceration is deep, the reparative process may close the wound except a canal at the base, leaving a fistula directly communicating with the bladder and cervical canal—namely, a vesico-cervico-uterine fistula.

The ureter, in its normal position, cannot well communicate with the vagina as a direct result of injury during childbirth. In loss of tissue extensive enough to involve the ureter in the edge of the fistula, the ureter may communicate with the vagina, and later in the process of

healing become turned out upon the vaginal surface. This fistulous opening, according to Emmet,[1] is more commonly the result of cellulitis followed by an abscess. During this pathological process the ureter becomes drawn up to the level of the vagina and fastened there, its canal bent and the flow of urine partially obstructed. In time inflammation is excited, perforation follows, and the urine escapes into the vagina, generally in the cul-de-sac behind the cervix.

FIG. 84.

Location of Various Forms of Fistulæ: 1, vesico-uterine fistula; 2, vesico-utero-vaginal fistula; 3, vesico-vaginal fistula; 4, urethro-vaginal fistula; 5, recto-vaginal fistula; 6, recto-labial fistula; 7, fistula in ano.

These urogenital openings vary much in contour. They may be round, oval, elliptical, angular, or linear. The usual form is the oval or elliptical—a shape given, according to Agnew, by the stronger contraction of the central longitudinal muscular fibres over those at the sides of the vagina and the circular fibres. Fistulæ range from a size so small that they are found with great difficulty, and admit only the smallest probe to those which involve the entire septum. In the latter condition the wall of the bladder is apt to protrude through the opening and present a greatly inflamed and proliferated surface.

The complications that may be found associated with fistula are stricture or occlusion of the urethra, cicatricial bands or atresia of the vagina, and Simon met with a case in which inflammatory union had even taken place between the prolapsed vesical wall and the posterior vaginal wall. There is also the local inflammation excited by the continual escape of the acrid urine through an unnatural channel.

CLASSIFICATION.—In accordance with the above anatomical peculiarities, a plan first introduced by Jobert and followed generally by later gynecological writers, urinary fistulæ are grouped and given distinctive names, as follows:

Urinary Fistulæ.

Vesico-vaginal { At the trigonum vesicæ.
At the bas-fond.

[1] *Op. cit.*, p. 847.

Urethro-vaginal.
Vesico-uterine { cervico- / corporeo-
Vesico-utero-vaginal.
Uretero-vaginal.
Uretero-uterine.

Symptoms.—In direct injury the presence of a fistula is indicated by the immediate and involuntary escape of the urine per vaginam. The usual symptoms, however, are those which follow difficult labor, accompanied with considerable bruising and gangrene of the soft parts. On the separation of the slough within three or four days to several weeks the urine escapes through the fistulous opening thus established. The urine, depending upon the nature and seat of the fistula, may flow constantly from the vagina or only at intervals. If the lesion is high up in the septum, above the ureters, the bladder will have retentive power while the body is erect. In fissure-like openings the edges may be sufficiently approximated, or in other conditions a fold of the vagina or the uterus may act as a plug to close the bladder. In urethro-vaginal fistulæ the urine is retained normally, but at the time of micturition the contents of the bladder may escape entirely by the fistula if large, or if small partly by the urethra and partly by the vagina. If but one ureter is involved in the lesion, this is constantly pouring its secretion into the vagina, while that from the other flows into the bladder and is passed naturally.

The more or less constant flow of an acrid, irritating excretion over a mucous and cutaneous surface not intended by nature for its conveyance results in inflammation and excoriation of these parts. The nates, thighs, and vulva are kept constantly wet, and become red, swollen, excoriated, and covered, it may be, with a vesicular or pustular eruption. Urinary concretions may form in the vagina, and a strong urinous odor emanates from the person, which excludes her from society and incapacitates her for participation in the ordinary pleasures and duties of life. Under such physical and mental strain it is not long before the general health suffers, grave disorders supervene, and the patient is condemned to a most miserable and pitiable existence.

As a rule, the capacity for conception is interfered with, and such women remain sterile, or, if they become pregnant, abortion or miscarriage is liable to occur. The characteristic symptoms are, in summary, the constant escape of the urine from the vagina; the effects of the wet condition and local irritation as shown by excoriations, vulvitis, vaginitis; and the highly offensive odor emitted by the clothing and person. Menstruation is frequently in abeyance as long as the fistula is present, but appears soon after cure of the abnormality.

Diagnosis.—The above symptoms may leave no doubt in the mind

of the surgeon as to the presence of a fistula, but it can be certainly determined only by an exploration of the vagina itself. Sometimes, in long-standing cases of vesical catarrh with thickening of the walls and lessening of capacity, weakness or paralysis of the bladder may develop and the urine dribble away *per orificium urethræ*. Large fistulæ are generally detected by a simple digital examination with the patient upon the back, and their nature and extent made out, while small ones often tax the skill and ingenuity of the expert. In the latter case the sense of sight must be brought to the aid of touch.

The patient for examination should be placed in one of the following described positions: the first and most common in this country is upon the left side with the knees drawn up (Sims' position). A Sims speculum is introduced and the perineum drawn well back. The air, rushing in, dilates the vagina and allows the anterior wall to be inspected in a good light. The second position for examination which the author has found to serve as good a purpose is with the patient on her back in the manner described by Simon, and known as "Simon's position." A Simon speculum is introduced, by which the perineum is retracted and all of the anterior vaginal wall exposed to view. In either position the folds and hollow of the vagina may be more easily seen by the aid of tenacula, and a careful search will reveal the opening through which the urine escapes. If doubt exists, a probe may be made to pass through the opening into the bladder.

If the orifice is very minute, additional means must be resorted to. In these cases colored fluids should be injected into the bladder, and the point of their appearance upon the vaginal surface carefully noted. Milk or an infusion of cochineal or indigo will be sufficient to discover the seat of capillary perforations, whose course and extent may then be determined by the probe.

Should the bladder be in that extremely irritable condition when the injection of any fluid causes considerable pain, Bozeman's linen test may occasionally be found serviceable. The test is based upon the fact that mucus and pus spread *upon* linen, while urine instantly passes *through* it. That portion of the vagina where the urinary sinus is supposed to exist is wiped perfectly clean, and a piece of thin linen pressed quickly and smoothly upon it, at the same time close attention is paid to see where a spot of moisture appears.

Small openings at the upper part of the vaginal surface and suspected of ureteral connection are recognized by a thin probe taking the direction of the ureter, and from the fact that the colored fluid injected into the bladder does not make its exit by this opening; the closure of such a fistula gives rise to the violent symptoms of acute hydronephrosis.

At times it is extremely difficult to determine the location and character of a fistula, owing to the contraction of cicatricial tissue which

prevents the use of the speculum. In such cases a preliminary course of treatment must first be adopted for the removal of the stricture.

Prognosis.—Within a comparatively recent date fistulæ incident to women were looked upon as beyond the resources of art. Reports of the proceedings of the Academy of Medicine of Paris (1838–45) show that eminent surgeons—Gerdy, Velpeau, Amussat, Berard, and others—had little confidence in any operative procedure then practised. Velpeau[1] questioned the success of published cures and doubted the advisability of operative measures. Jeanselme (1841) not only had no faith in the radical cure of these affections, but was suspicious of the veracity of those reporting such. Liston[2] asserted that an operation only made the patient worse, and added, "There is little hope in a case of any size." Miller[3] advised palliative measures only. The above sketch is sufficient to show the light in which fistulæ were regarded by the majority of surgeons at that time. By the intervention of modern surgery the doleful outlook to both operator and patient has been reversed, and the affections are now regarded as susceptible of cure.

It has happened in quite a number of cases of recent origin that a spontaneous cure followed the separation of the slough, but under ordinary circumstances the lesion remains permanently open and requires radical treatment for its relief.

By virtue of the modern method presented by Dr. Sims in 1852 this opprobrium of surgery has been removed, and the prognosis made certain and positive in all cases accessible to treatment. Dr. Sims[4] in 1860 stated: "Of 261 cases of vaginal fistula (vesical and rectal), 216 have been permanently cured by the silver-wire suture, 36 are curable, and 9 incurable. Every case is curable when the operation is practicable, provided there is no constitutional vice to interfere with the powers of union. Success is the rule, failure the exception." In a letter in 1864[5] he gives a record of having obtained 260 cures in 312 cases.

These statements have been fully confirmed by the experience of later operators. Emmet[6] gives the result of 171 cases of fistula met with in his practice as 149 cured, 11 improved, 4 not improved, 1 died, 6 result unknown. It is seen that only 2.33 per cent. of all the cases proved incurable. Of these, 2 were so from loss of tissue, another from a large exostosis behind the pubes, rendering an operation impracticable, and the fourth from the excessively fat condition of the patient. The 11 reported as simply improved were every one cured or could have been by subsequent operation. The single death resulted from advanced disease of the kidney.

Treatment.—This division of the subject deals more especially

[1] *Operative Surgery*, 1839.
[2] *Practical Surgery*, 1846.
[3] *Practice of Surgery*, 1852.
[4] Gardner's *Notes to Scanzoni*, p. 515.
[5] *Thesis* of Monteros, Paris, 1864.
[6] *Op. cit.*

with the methods of modifying the evils or obtaining a cure of urinary fistula; but it may not be out of place to speak briefly of preventive measures. By these it is not to be understood that such means are referred to as timely use of the obstetrical forceps or removal of irritating bodies, such as pessaries, calculi, etc., but proper attention to the conditions which have a disposition to terminate in fistulæ. Dr. Byford, who looks upon puerperal vaginitis as the chief cause of urinary fistulæ, is convinced, and lays stress upon the fact, that he has several times prevented the occurrence of fistulæ in such cases by allowing no pressure to come against the vesico-vaginal septum from any accumulation of urine in the bladder during the periods of inflammation and sloughing, and by seeking to reduce the latter as much as possible through the plentiful use of water by vaginal injection and by other appropriate remedies.

Methods of Cure.

1st. Application of means for obtaining spontaneous closure;
2d. Cauterization;
3d. Suture;
4th. Transplantation;
5th. Occlusion of the uterus or vagina;
6th. Methods adapted to special cases.

Spontaneous Closure.—Occasionally small fistulæ, and less frequently those of large size, become occluded without surgical interference. Possibly, these cases of spontaneous closure might occur oftener than they do if the measures advised for prevention of fistulæ—namely, copious douches of warm water and drainage of the bladder—were in each case carried out with scrupulous care and for a sufficient time to give Nature a chance: a strenuous effort must also be made to keep the body well nourished in order to promote the healing process.

M. Ed. F. Bouqué, in his elaborate brochure on *Treatment of Uro-genital Fistules in Women by Secondary Union*, published in 1875, has collected sixty cases of spontaneous cure. The shortest time after which closure took place was five days, and the longest six and a half years.

Some curious histories and methods of management may be noted—among others, one reported by Prof. Raffaele at the congress at Florence in 1841.[1] The fistula was diminished in size by the use of caustics. "Pregnancy supervened and treatment was suspended; notwithstanding, the fistula healed spontaneously during gestation." He advised the use of a bladder filled with air and introduced into the vagina, and believed that in this way he would imitate the pressure exerted upon the fistula by the gravid uterus.

Another case is cited by Corradi.[2] Eighteen months before the

[1] Bouqué: *op. cit.*, p. 72.

[2] J. Corradi: *Études cliniques sur les Rétrécissements de l'Urèthre, etc.*, Florence, 1870.

patient had had a difficult and protracted labor, followed by a vesico-vaginal fistula, which for a year resisted all methods of treatment, even Sims' operation. Corradi had a button made of gold similar to Dupuytren's for ranula, and a forceps also similar to Dupuytren's for extraction of lachrymal canulæ, for the purpose of fixing the button in position. The latter was placed in the fistulous opening, so that one facette of the button was in the bladder and the other in the vagina. Micturition was immediately re-established, and not a single drop of urine passed any longer by the vagina. For five years the woman wore this button without experiencing any inconvenience; then by accident the button dropped out, and the urine still continued to pass entirely through the urethra. A few days after Corradi examined the patient, but found no fistula in the vagina.

Leishman[1] has related the case of a vesico-uterine fistula in which Nature brought about a cure in the same manner as Jobert had previously done by his ingenious procedure. There was spontaneous closure of the neck of the womb, so that the patient was completely relieved of her infirmity. Menstruation took place regularly through the bladder.

In some of these cases collected by Bouqué the permanent catheter and scrupulous attention to cleanliness were of great assistance in accomplishing a cure.

Cauterization.—Before the use of the suture was brought to its present state of perfection this was the favorite method of treating all forms of urinary fistulæ. The principal agents employed were nitrate of silver and the actual cautery. Others were also used, as sulphuric, nitric, nitro-muriatic, and chromic acids, caustic potash, caustic ammonia, tincture of cantharides, creasote, the red iron, and the galvano-cautery.

At the present time, however, but little attention is devoted to this method, except from an historical point of view by those whom it may interest as having formed an epoch in the development of a cure for fistula, or because of its association with such names as Dupuytren, Delpech, and a few others of distinction.

As late as 1875 a monograph (previously mentioned) upon this method by Bouqué of Ghent appeared, in which he has collected the records of 109 cases cured by simple cauterization, and 35 cases to which uniting agents were applied after cauterization. Of the latter, there were 25 cures, 6 failures, and 4 improved; of the 6 failures, 5 deaths.

It is only rarely and under special circumstances that this procedure is now considered proper. Lack of requisite skill or the necessary instruments for Sims' or Simon's operation would be the principal

[1] *Glasgow Med. Journ.*, Oct., 1861; Bouqué: *op. cit.*

reasons. It is also admissible in some cases of minute fistulæ, wire-holes, or the occasional small aperture caused from lack of union at some point.

The fistula, being brought to view by the introduction of a Sims speculum, is thoroughly touched by a pointed stick of nitrate of silver or the cautery. A tampon or glass plug—latter preferable—is then placed in the vagina in order to separate the vaginal walls and to support the vesico-vaginal septum during the process of granulation. A permanent catheter is used to prevent distension of the bladder and to hinder as far as possible the urine from passing through the fistule.

Cauterization is not to be repeated until the slough formed has fallen and the process of granulation and cicatrization has had an opportunity to accomplish what it can.

Suture.—Of the three modes of treatment by the suture now in general use, Simon's is the most popular in Germany, Sims' in England, France, and America, while Bozeman's has secured the favor of some in all, as has Simon's in other countries than his own.

Preparatory Treatment.—It cannot be urged too vehemently nor too persistently that in no class of cases is this so essential as before plastic operations about the vagina, especially for fistula. An anæmic and depraved condition of the constitution has many times caused a skilfully performed operation to prove a failure.

Preparatory treatment is both systemic and local.

Systemic treatment is carried out by means of chalybeates, bitter tonics, mineral acids, and, above all, by the most nourishing foods and those most easily assimilated; the latter are to be accompanied by digestants if the digestive organs are in an atonic condition, as they frequently are.

Massage and the galvanic or faradic current are also useful. Out-door exercise, a sojourn in the country, or a water-trip, especially a sea-voyage, are important aids.

Local preparatory treatment has for its object to procure as nearly as possible a healthy condition of the edges of the fistula and surrounding parts, and to remove any obstacles to a complete view of the fistula. Sitz-baths, vaginal douches, and all that pertains to constant cleanliness are potent factors in the local preparation.

Emmet has directed attention to the harm of using about the patient napkins which have merely been dried without washing. The solids of the urine by this process become concentrated, and, adding their strength to the fresh urine, cause it to be all the more irritating.

Incrustations of urinary salts that may be found upon the edges of the fistula, in the vagina, or on the external parts should be removed by a stream of warm water, a soft sponge, and the dressing-forceps, and the seat of the sabulous deposit brushed over with a solution of

nitrate of silver, which is to be reapplied every fifth day till the excoriated surfaces are healed. The parts are to be constantly protected by anointing them with vaseline or ointment of oxide of zinc. The care given to the edges if inflamed and thickened can neither be too great nor too solicitous, since upon their good condition depends much of the success of the operation.

In times past, when copious douches of hot or tepid water were not so generally recommended in the majority of affections of the genital organs, the following conditions were frequently observed in patients suffering from fistula: extensive incrustations, abscesses, excoriations, reaching even down upon the thighs; the anterior wall of the bladder protruding through the fistula and covered with phosphatic deposits, which prevented the patient walking except by enduring the most excruciating pain; and when all were combined, as occasionally happened, the woman presented a most lamentable spectacle.

If the vaginal canal is narrowed at any point by cicatricial bands, they are to be severed. Often a band will extend across the vagina just below the fistula, thus partially or wholly obstructing the view and presenting difficulties to the introduction of sutures.

Placing the patient on the back, the operator introduces two fingers into the rectum and the thumb into the vagina for guidance and counter-pressure, and cuts with blunt scissors any constricting bands which are found by compression of the thumb.

Scissors are preferred to the knife, as there is less hemorrhage, and cicatricial tissue thus divided heals more slowly, thereby allowing greater time for absorption to be produced by pressure. This pressure is exerted by means of a Sims glass plug, which is introduced immediately after the operation of severing the constricting bands. The plug is retained by a T-bandage, and the patient placed in bed, where she should remain about ten days. When deemed proper, after twenty-four or thirty-six hours, remove the plug and inject a large amount of warm carbolized water into the canal once a day, or oftener if there is a profuse discharge. The plug is then to be reinserted, and worn as many hours each day as the patient can tolerate until the incisions have healed. If at the end of this time the canal is not sufficiently widened, the process must be repeated.

Sims' Operation.—The table to be used will be found most convenient if its dimensions are about five by two and a half feet. It is covered with a folded blanket and at the lower end with a rubber cloth. The patient, protected by drawers, night-dress, stockings, and a sheet, is placed in the semi-prone or Sims' position, as it is frequently called; that is, upon the side, usually the left, with the under arm drawn backward, so that the breast rests upon the table, the upper thigh flexed at a right angle with the body, and the lower thigh a little less so; a hard

cushion placed under the hips, by which they are elevated, will facilitate the view of fistulæ in some situations.

The number of assistants is four—namely, one to administer the anæsthetic; a second, to hold the speculum and lift up the nates; a third, to sponge and wash the sponges; and a fourth, to hand the instruments. If only three assistants can be obtained, the instruments may be laid out within reach of the operator, thus dispensing with a fourth assistant. The instruments should be arranged upon a table conveniently near and with reference to the order of the operation. Plenty of needles, curved and straight, of various sizes, and threaded with silk loops half knotted at the eye, should be stuck through a piece of chamois-skin, or, better still, into a sheet of cork, near at hand.

The necessary instruments are—a Sims speculum; a long-handled knife with a narrow blade; long-handled right- and left-curved scissors; tooth-forceps; several tenacula; blunt hook; Sims' fork and fulcrum; Sims' or Emmet's wire-twister and needle-holder; needles; fine silk, of which No. 1, 2, or 3, braided, is as reliable as any; silver wire No. 29—a size coarser or finer is sometimes required; Sims' sponge-holders and several small sponges.

The steps of the operation are three:

1st, vivifying the margins of the fistula;

2d, introducing the sutures;

3d, coapting the edges and fastening the sutures.

Vivifying the Margins.—It is essential that the borders should be drawn together in the direction of the least traction. This point must be borne in mind at the outset, since in many cases it governs the shape and directions of the denudation.

The highest or least accessible portion of the fistula is caught up by a tenaculum or tooth-forceps and pared by a knife, or preferably by scissors. If the strip can be removed in one entire piece, it is advisable, as then there is a certainty that the edges are perfectly freshened.

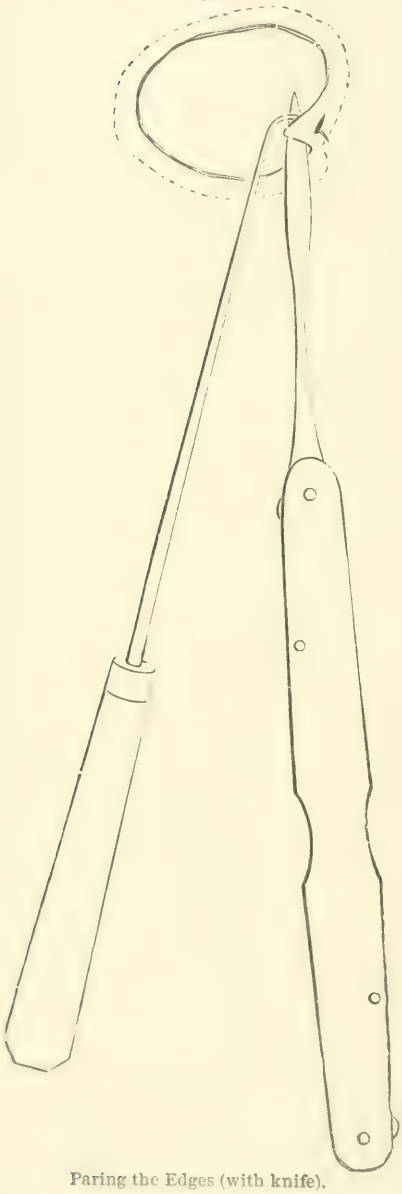
The mucous membrane of the bladder should be carefully avoided in the cutting or there is liable to be troublesome hemorrhage. The denudation consists in bevelling of the borders at the expense of the vaginal surface. The latter is considerably encroached upon if the edges are thin, in order to procure a broad surface for union.

Another method of obtaining sufficient surface when the edges are thin is to split them and spread them open, so that when the fistula is brought together the two surfaces of one edge lie upon the two opposing surfaces of the other. Still another plan is to split one edge and bevel both sides of the other, so that when approximated one fits into the other. But sufficient width can always be obtained by the first method, which has the advantage of being most easily performed.

If the first strip removed does not give breadth enough, pare another just outside of the first.

Each end of the opening must terminate in an acute angle, which is to be formed by the operator, if it does not already exist, by extending the denudation into a long point on the vaginal surface. If proper attention is not given to the shaping of these angles, there will be a puckering of the tissues which will result in a small orifice remaining at one or both ends of the line of union after the rest of the fistula has healed.

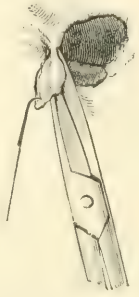
Fig. 85.



Paring the Edges (with knife).

Hemorrhage can usually be checked by a stream of hot water, but if not by pressure or ligation. Pressure can be exerted by pushing the centre of a piece of thin cloth through the fistule; then, while the ends are held, cotton is packed into the sac thus formed on the vesical side. Sufficient pressure can then be brought to bear upon the bleeding surfaces by traction on the ends held in the hand. Emmet has found the following

Fig. 86.



Method of Paring the Edges (with scissors) (Savage).

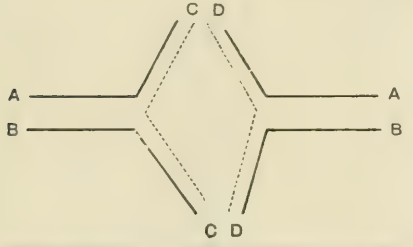
Fig. 87.

Bevelling of the Edges: A, vaginal surface; B, vesical; C C, lines of paring.

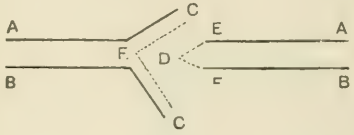
means of compression useful: A suture is "passed from the vagina through the septum into the bladder, on the finger as a guide, then across to some distance on the other side, and out into the vagina again. In this way the bleeding vessel, which comes from the neck of the uterus or from the neck of the bladder, is ligated, as it were, in the fold of tissue, and the bleeding arrested. One precaution, however, must be taken to avoid including the ureters; and this is done by passing the sutures at a less distance than half an inch on either side from the median line."[1]

In a case[2] of severe hemorrhage from severing the vesico-vaginal artery Simon ligated the artery with fine Chinese silk and brought the ends of the ligature out between two sutures into the vagina. The silk was removed on the fifth day, and no evil results followed from the presence of the ligature between the lips of the wound.

FIG. 88.



Second Method: A A, vaginal surface; B B, vesical surface; C C and D D, inner surfaces of split edges, and the ones to be coapted.



Third Method: C F C and E D E are to be coapted.

If the mucosa of the bladder should, by accident or otherwise, be included in the denudation, the hemorrhage into the bladder may be so profuse as to necessitate removing the stitches. Shortly before his death Dr. Peaslee lost a patient from this cause.[3]

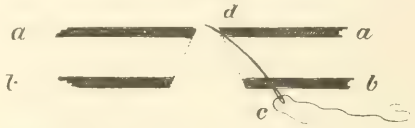
Placing the Sutures.—The needles to be used are slightly curved and one-half to three-quarters of an inch in length. Some prefer a straight needle. Those used by Sims were round with a cutting point. Agnew's needle is spear-shaped, with a countersunken eye, and is more of a cutting needle than that of Sims. As it is important that hemorrhage should be avoided as much as possible, a needle that simply displaces the tissues has been found most desirable; of this sort is Emmet's, which is slightly curved, smooth, round or somewhat flattened in one direction at the eye, and in the opposite at the point, and a countersunken eye. The changing diameter is favorable to displacement.

After the sutures are cut the desired length, eight or ten inches, the ends are bent over by a knife and pinched down by a pair of forceps,

[1] Emmet: *Prin. and Prac. of Gyn.*, p. 825, 1884.
[2] Simon: *Mittheil. aus der Chir.-Klin.*, 1861–65, i. Abtheil, S. 179.
[3] Emmet: *op. cit.*, p. 825.

in order that the loop may be as small as possible. The surgeon must also see that there are no kinks in the wire before it is introduced, as well as prevent them while placing it. The silk used to draw in the

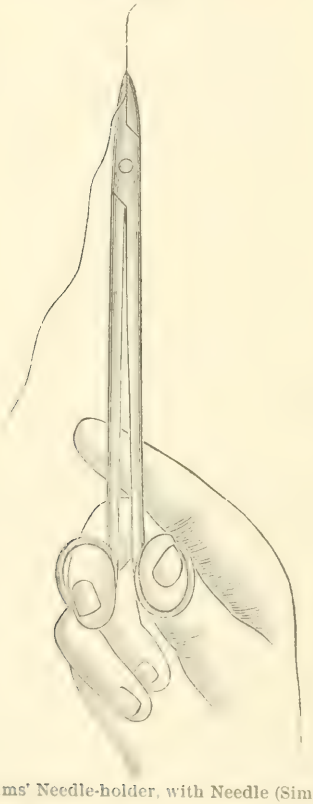
Fig. 89.



Direction taken by the Needle: *a*, vesical margin; *b*, vaginal margin; *c*, point of entrance of needle; *d*, point of exit of needle.

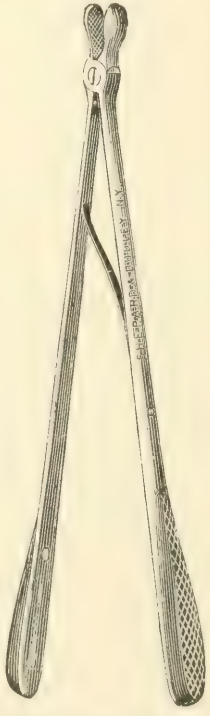
wire should be as fine as will be safe from breaking; No. 1, 2, or 3, braided or some variety of twisted silk of the same size, is usually employed. Each needle is to be threaded with a loop which is half

Fig. 90.



Sims' Needle-holder, with Needle (Sims).

Fig. 91.



Emmet's Needle-holder.

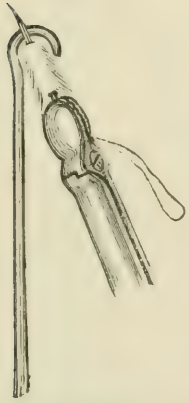
knotted at the eye. The loop end should be several inches long, that the wire may be easily hooked into it after it is drawn partly through the edge of the fistula.

The farthest or least accessible portion of the edge is now caught up by a tenaculum, and the needle inserted behind it in such a manner that the needle will pass in at some distance from the margin on the vaginal side, and come out near the meeting-line of the denuded surface and the vesical mucous membrane, and thus avoid puncturing the latter. Piercing the mucous membrane of the bladder may result in hemorrhage into the bladder sufficient to cause vesical tenesmus; but the most serious objection is that the needle-holes may remain as small fistulæ.

As soon as the point at which the needle will pass out is seen, counter-pressure is made by a blunt hook to aid its passage and prevent straining the tissues.

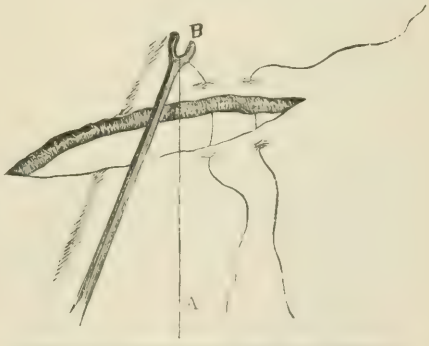
After the needle is pushed through as far as the end of the needle-holder will allow, the point is seized and the needle drawn through, while counter-pressure is still maintained. The silver is then hooked into the loop, and, after a Sims fork has been placed under the thread where it emerges to support the suture and obviate the risk of tearing the delicate edges, the silk loop is drawn through, followed by the sil-

Fig. 92.



Applying Counter-pressure (Emmet).

Fig. 93.



Supporting the Sutures by the Fork (Emmet).

ver. The ends of the wire are then lightly twisted together, and held back out of the way by the assistant who holds the speculum, or the suture may be nearly drawn through, the long end passed through the loop on the short end, brought back, and tucked under the speculum.

All the threads may be passed first, then all the wires drawn in; but the former are apt to become tangled and weakened by being saturated with blood and urine, so that it is advisable to introduce the silver after each silk thread. Plenty of tissue should be taken up by the stitches, which are to be from one-fifth to one-fourth of an inch apart. The exit and entrance of each suture should be as nearly opposite each other as possible, but so fine a surgeon as Emmet declares that even an experi-

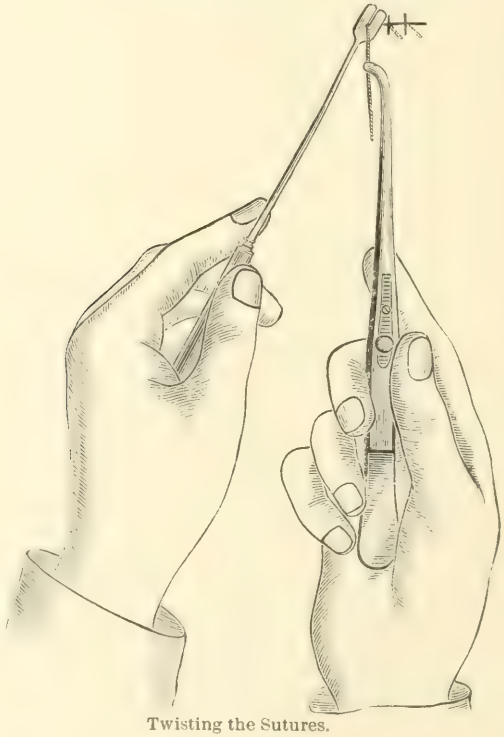
eneed operator may not always obtain the great accuracy in this respect which authors formerly insisted upon, but that with a reasonable amount of care on this point and a proper shouldering of the wires, so that the twist is in the right place, the desired result will usually be obtained—namely, union by first intention.

Securing the Sutures.—The wires are now grasped by the operator and the edges of the fistula approximated. Each suture is then shouldered; that is, the wires along both sides of the wound are each bent to a right angle over a tenaculum, the point of the angle being just far enough from the needle-hole to be in the plane of the denudation when both ends are drawn up tight. As each suture is shouldered it is next seized by the twister, the operator being sure that both ends are caught—otherwise one wire may be twisted off—and a Sims shield is placed over the wires to support them and cause the twisting point to be imme-

FIG. 94.

Shouldering Sutures.

FIG. 95.



Twisting the Sutures.

diately over the line of union. The wires are twisted tightly enough to coapt the edges exactly and firmly, but with care to avoid strangulation.

The operator now inspects the line of union to see that no portions

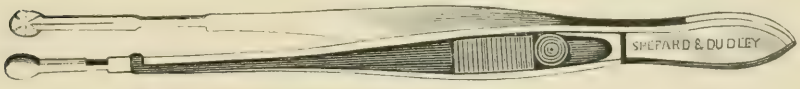
of the denuded surface are everted, for in such an event they would fail to unite by first intention, and thus leave a granulating surface; or, on the other hand, that there are no points of vaginal mucous membrane inverted to prevent union.

FIG. 96.

Sims' Shield or Fulcrum.

Any inaccuracies of this sort can easily be corrected by the use of two tenacula. The last item, though small in itself, has often much to do

FIG. 97.



Emmet's Twisting Tongs.

with the smoothness and regularity of the line of union on the vaginal surface.

The sutures are clipped off about half an inch from the surface, and bent over a tenaculum flat upon the vagina and alternately turned on one side and the other.

A Sims or Skene-Goodman self-retaining catheter is introduced, and

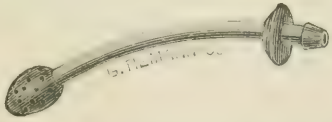
FIG. 98.

Sims' Sigmoid Catheter, self-retaining.

FIG. 99.

Sims' Self-retaining Catheter, new style.

FIG. 100.



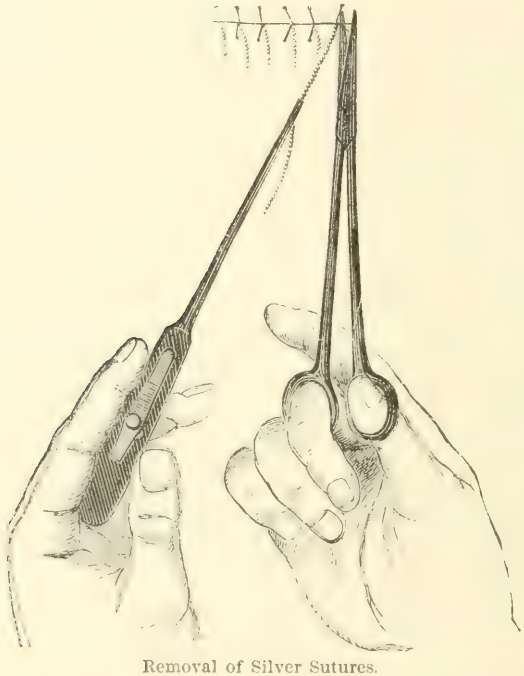
Skene's Modification of Goodman's Self-retaining Catheter (Skene).

if there is evidence of much blood having escaped into the bladder, the latter must be washed out or the clots formed may give rise to vesical tenesmus. The catheter must be carefully watched by the nurse, to see that it does not become clogged. It should be removed at least every twenty-four hours, or oftener if necessary, cleansed with a brush, soap, and carbolized water, and immediately reinserted; or, what is better, have two catheters, which are used alternately.

The urine can be received in a dish from the rubber tubing fastened to the end of the catheter, or the dish may be placed immediately under the end of the catheter, which projects a little way beyond the vulva. The patient should be given a warm vaginal douche once a day. The bowels are kept constipated with opium until thirty-six hours before removal of the stitches, when a laxative is administered. Near the time at which a movement is expected an injection of six ounces of warm olive oil is sometimes given, as it softens the rectal accumulation and facilitates its passage. An enema of warm water may also be necessary.

The sutures are to be removed in from seven to fourteen days; Sims considered the eighth day the proper time. Colored fluid may be injected into the bladder before the stitches are taken out, and if there is leakage it is sometimes of avail to leave them in a few days longer.

Fig. 101.



Removal of Silver Sutures.

Dr. Schuppert[1] reported two cases in which leakage of injected fluid occurred on the sixth and seventh days, but there was perfect retention on the twelfth, when the stitches were removed.

To remove the sutures, hook up each one with a tenaculum, cut the wire with scissors, and then with a pair of dressing-forceps pull it out.

[1] *Vesico-vaginal Fistula*, 1866.

Wire-scissors have been devised which have hooked points for the purpose of catching up the wire and cutting it also. The operator has simply to seize the twist with a pair of forceps, and while making slight traction he places one hooked point under the wire, severs it, and draws it out. If the sutures are not imbedded, the latter plan is easier and more expeditious, and a tenaculum need not be used.

Immediately upon removing the sutures, or perhaps not before a lapse of several days, the operator may find that success has not attended his efforts, but at least the fistula will have been made smaller, and usually can be perfectly closed by another operation. There are, however, occasional cases which require several operations before a cure is accomplished.

Simon's Operation.—The principles upon which this operator bases his method of treatment of vesico-vaginal fistula differ quite markedly from Sims', with whom he was a contemporary worker. The measure of success which has attended this mode and the popularity which it has obtained in Germany entitle it to a place next to, or even on the same level with, that of Sims.

The distinctive features of Simon's operation are—

1st. He places the patient upon the back in an exaggerated lithotomy position.

2d. He intentionally incises the vesical mucous membrane if the edges contain much cicatricial tissue.

3d. He denies the superiority of silver over silk, and even prefers the latter.

4th. He employs no permanent catheter, and allows the patient to urinate as soon as she is able and whenever she has a desire to do so.

5th. The after-treatment is negative.

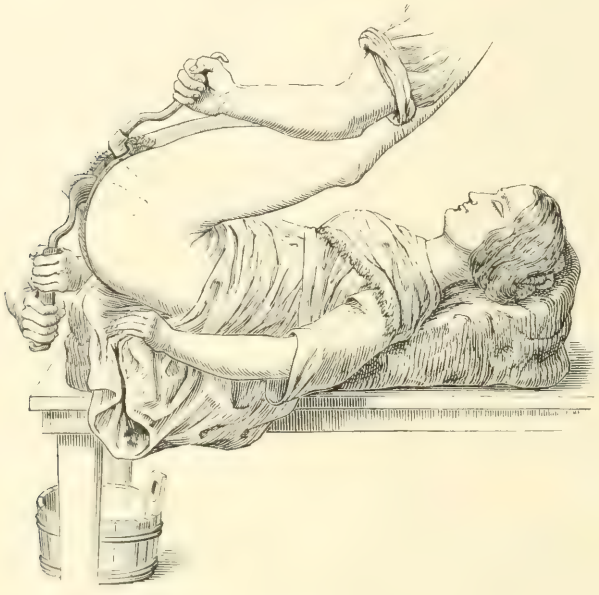
In 1862, Simon fully described his method, with its advantages, in his work on *The Operation for Vesico-vaginal Fistula*. He called the posture used for his operation the breech-back (Steiss-Rückenlage), to distinguish it from the ordinary dorsal position, and because the most projecting part is the breech, which presents itself in a manner very similar to that of breech presentation. The hips are elevated somewhat above the level of the abdomen of the patient, so that the trunk is in a position very like the knee-elbow. If the fistula is situated high in the vagina, the hips must be considerably elevated and the thighs drawn upward and backward as far as possible. If, on the contrary, the fistula is seated in the lower part of the vagina, less elevation of the hips and less flexion of the thighs are required.

Whenever it is possible the fistula is drawn down near the introitus vaginæ, on account of the light and greater convenience of the operator. To do this slow and gentle traction is made upon the cervix by seizing it with a Museux forceps. If found to be movable, two threads

are passed through the cervical lips, and by them the neck and the part to be operated upon are maintained in the desired position. In the majority of cases, however, the above procedure will be impossible, and instruments for otherwise exposing the fistula will be needed.

These are four in number—viz. a perineal retractor, an anterior speculum, and two side levers. The perineal retractor is a blade similar to that of Sims' speculum fixed by means of a spring into a handle, but has two additional large sizes. The anterior speculum is flat, and is fas-

Fig. 102.



Simon's Position for Vesico-vaginal Fistula (Simon).

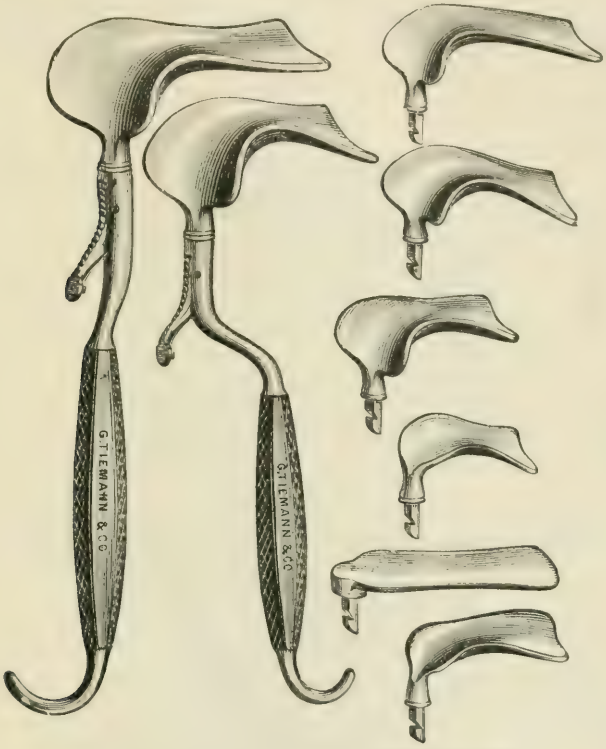
tened by a catch into a handle. There are several sizes, which also vary in their proportionate length and width. The side levers are of two shapes—those bent at a right angle and those at an obtuse angle. The anterior speculum holds up the anterior wall, and the side levers press back the lateral portions of the vagina and the labia.

Any cord-like constrictions are to be cut; Simon has even severed vaginal folds which offered obstruction.

Vivifying the Edges.—Simon does not seek to obtain a sufficient surface for union at the expense of the vagina alone, but gives preference to a deep funnel-shaped incision, including all the tissues down to the vesical mucous membrane, or even through it. Cicatricial tissue must be removed as far as possible in order to get union by first intention, and to do this he did not hesitate to pare the edges freely, even if a fistula large already were made still larger. His defence of this free

incising is that union is more apt to take place, and even if it has to be repeated, it does not cause the patient to lose any more urine. In general, he places but little importance on avoiding incision of the

Fig. 103.



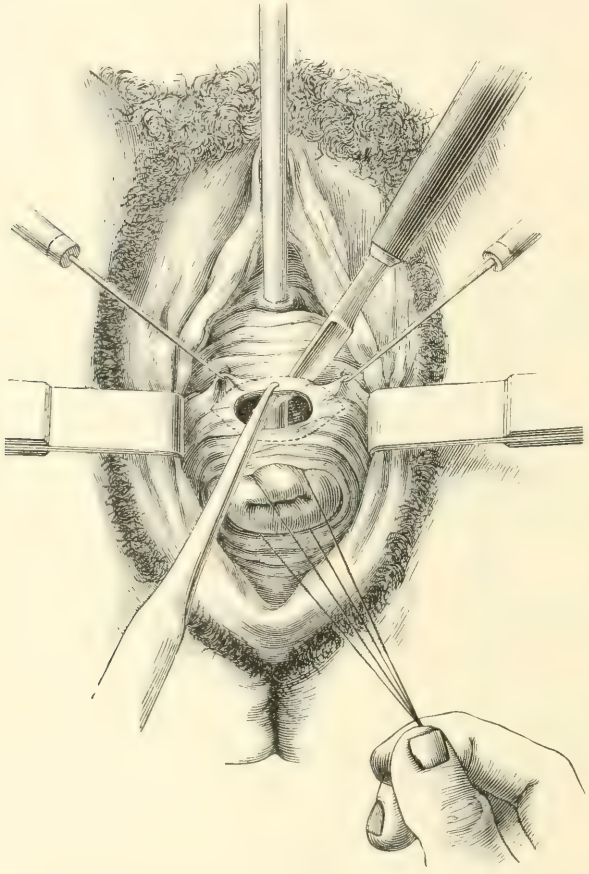
Simon's Specula: blades of various shapes and sizes.

bladder. Several advantages are claimed for the shape and depth of his vivification, which are principally based upon two points—that union does not readily take place between cicatricial tissues, and that it is more sure to occur if the tissues join each other in the same plane in which they naturally lie. The former point he is tenacious about. The deep funnel-shaped incision removes all cicatricial substance. The steep-bevelled edges are more conducive to union than the flat-bevelled, since in the former the nerves, vessels, etc. are continued in their natural direction. An unnecessary amount of denudation is made in the latter form, as only the upper edges unite in any case. When the margins are bevelled flat, they are made thin, which is a great drawback if the first operation is a failure and a second freshening is required. He considers that catarrh is not a more probable sequence of this method than of the other.

Method of Uniting the Edges.—In 1854, Simon published his method

of uniting the edges, which, in a modified form, has been the one employed ever since. Coaptation of the margins is accomplished by a single series of sutures in small fistulæ, and by his double suture (Entspannungs und Vereinigungs-Näthe) in the large ones. The "relaxing" sutures are introduced very deep, passing either near to or through the vesical mucous membrane, according to the size of the

Fig. 104.



Incising the Edges of the Fistula, immediate access (Simon).

fistula, and are placed at a considerable distance from the edge. This causes the tissues upon either side of the fistula to approach each other, and thus produce a relaxation at the line of union.

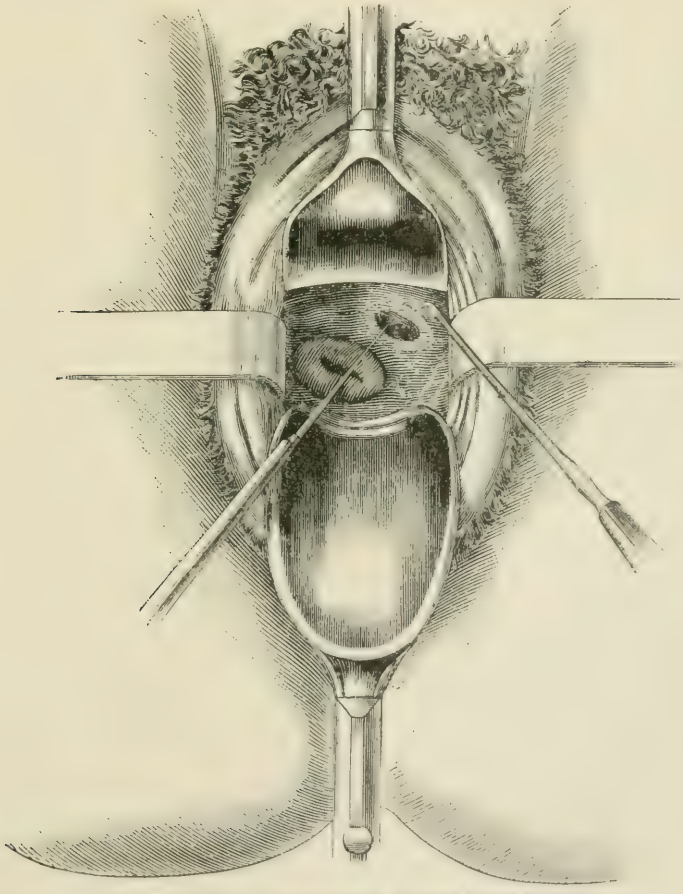
The "uniting" sutures are introduced quite near the edge, and always pass below the vesical mucous membrane. The stitches of this series alternate with those of the other, and the two rows are complemental in their action. Simon considers it of very little importance whether the vesical mucous membrane is penetrated or not,

but care is taken that it is not inverted so as to be included between the lips of the wound.

The sutures used are of fine silk, and are placed from one to one and a half lines apart.

After-treatment.—From a series of observations upon two important points, Simon came to conclusions which are quite opposed to those formerly held, and also to those now entertained by the majority of surgeons who operate according to American methods. These are—

FIG. 105.



Incising the Edges of the Fistula, mediate access (Simon).

1st. That the urine has no deleterious effect, either upon the wound or the new scar, and neither prevents union by first intention nor breaks up a cicatrix when once formed.

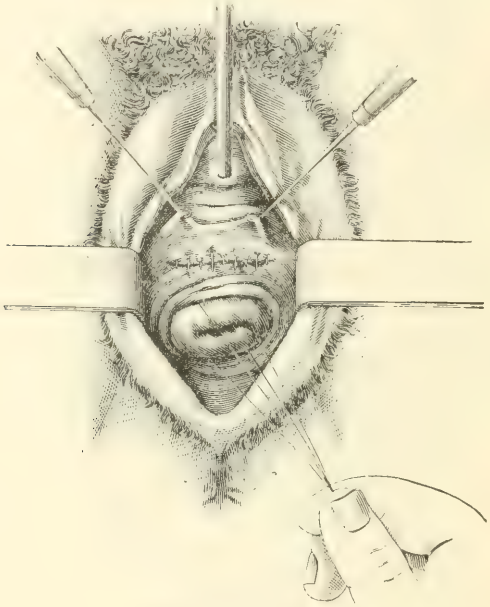
2d. That if the edges have been thoroughly vivified and properly united, no harm will follow from the degree of distension resulting

from a normal filling of the bladder; and a stationary catheter has injurious effects.

In 1860 he announced his "negative after-treatment as a thoroughly rational method, and in 1862 as the only rational one."[1]

The patient takes any position in bed which she prefers. The permanent catheter is dispensed with, and she passes water naturally whenever she feels a desire to do so, lying upon a bedpan, or, if that is objectionable, getting upon the hands and knees or sitting up. Where there is inability on the part of the patient to evacuate the bladder, as

FIG. 106.



Sutures Tied (Simon).

sometimes happens in the first twenty-four hours, the urine is drawn at proper intervals.

Patients are allowed to eat whatever they like.

The regular movements of the bowels are not artificially hindered, and it is recommended that they be kept loose in order that there may be no straining. A daily vaginal douche is used, but the bladder is not washed out. Should there be any vesical tenesmus, it is relieved by eight-grain doses of morphia.

The sutures are removed on the fourth or fifth day if the fistula can be reached with ease; in difficult cases they may remain till the sixth or seventh day. Simon asserts that they have stayed several weeks

[1] Simon: "Historical Remarks on Operative Occlusion of the Vagina, etc.," *Deutsche Klinik*, No. 45, 1868; *Am. Journ. Obstet.*, Aug., 1869.

when it had happened that the stitches had been cut off just in front of the knots and had become imbedded in the tissues; and this with no more harm than with silver sutures.

On the eighth day the patients are permitted to leave the bed, even if the stitches are not yet all out, and in some favorable cases they have been allowed to rise after the first twenty-four hours, and in two or three days even to take out-door exercise.

Simon reports the following results: By his old method (before 1859), "of 22 fistules in 22 patients, there were cured completely 14 fistulæ in 14 patients. 5 fistulæ in 5 patients closed up to small fistulous openings. Of these, 1 patient was afterward cured entirely by kolpokleisis; another has placed herself under my care. 1 patient with 1 fistule was discharged as incurable (is now again under my treatment). 2 patients with 2 fistulæ died."

By his improved method he reports: "Of 96 fistulæ which occurred in 83 patients, 89 fistulæ, equal to $92\frac{2}{3}$ per cent. (77 patients), were cured, and only 4 patients, equal to $4\frac{1}{3}$ per cent., died."

The total results of these two series are as follows: "Of 118 fistulæ occurring in 105 patients, there were 104 fistulæ in 92 patients cured completely (a later cure is counted under the first category); 5 fistulæ in 5 patients almost entirely closed; 2 patients with 3 fistulæ discharged as incurable; 6 patients died."[1]

Contemporary workers in the same field, Sims and Simon, both gained the object for which they labored, but each in his own way, and each independent of the acts and aims of the other. The achievements of our own countryman have been so brilliant that our eyes have sometimes been blinded to the scarcely less shining example of success which Simon has shown.

Although it is incomprehensible how any one who has acquainted himself with the virtues of the silver suture can prefer another, it is also equally strange that the merits possessed by Simon's method of exposing fistula is so little appreciated. In an obese patient, with a fistula situated high in the vagina or with an extensive loss of tissue at the base of the bladder, the opening can be brought into view and made accessible to operative procedures by the breech-back position and the Simon specula in a manner not attainable by any other means. Some have objected to the Simon position because of the sagging of the anterior wall, but this defect will not be observed if the patient is put in the *position as taught by Simon*, and not simply in the ordinary dorsal decubitus.

Bozeman's Method.—In 1856, Bozeman published his mode of operating upon vesico-vaginal fistula, the distinctive and original feature of which is the "button" suture. He was one of the earliest and most

[1] *Deutsche Klinik*, No. 45, 1868; *Am. Journ. Obstet.*, Aug., 1869.

earnest advocates of a systematic course of preparatory treatment, and, though others have appreciated and insisted upon its importance, none have labored more assiduously, both by publications and practice, to bring it to a systematized method and elevate it to the dignity of being recognized as a regular surgical procedure.

Bozeman's method by "gradual approaches," or kolpoecpetasis[1] as he has called it later, is designed to be the preparatory treatment of such cases as present obstructions to view of, or operating upon, a fistule, and these are almost inevitable sequents of any degree of sloughing. His method began to be developed in 1855 with a case[2] in which there were two fistulæ, one above and one below the obstruction, which consisted of an adhesion that "extended obliquely across from the right side of the cervix to the left side of the vagina, thus concealing from view the os uteri and rendering an exploration of the entire canal impossible." He closed the lower fistule; then, by incision of the adhesion and dilatation of the canal with compressed sponges in an oil-silk bag, overcame the obstacle and was able to close the second fistule.

This method has been more and more extensively employed, until it has become the chief agent in obviating the necessity of kolpokleisis and partial genital kleisis.

In the same proportion that an operation interferes with the function of the organ or region operated upon does it fail to be considered a successful surgical procedure. Kolpokleisis, or partial genital kleisis, interferes with the sexual and procreative functions; consequently, surgeons gladly accept any measures by which they are enabled to avoid that *dernier ressort*.

Through this widening process not only is obstruction to view removed, but also a laxness of the walls is obtained by which the edges of the fistulous opening can be coapted without tension.

Dr. Bozeman believes in extending the application of this treatment even to those cases which seem hopeless or appear to demand kolpokleisis. As proof of his claims he offers the following statistics: "Simon, 34 cases treated by genital kleisis out of 105 presented, 32.38 per cent.; Sims, 30 cases by genital kleisis out of 312 presented, 9.62 per cent.; Emmet, 7 cases by genital kleisis out of 75 presented, 9.33 per cent.; Baker Brown, 6 cases treated by genital kleisis out of 89 presented, 6.74 per cent.; Bozeman, 2 cases treated by genital kleisis out of 120 cases presented, 1.66 per cent."[3]

He states that Sims' percentage is approximately correct, and that Simon's is entirely so, as far as concerns occlusion of the vulvo-vaginal

[1] *Trans. Am. Gyn. Soc.*, 1879, p. 391; *ibid.*, 1881, p. 139.

[2] Bozeman: *Vesico-vaginal Fistule*, Montgomery, Ala., 1856.

[3] *Trans. Am. Gyn. Soc.*, 1881, p. 170.

canal and turning the cervix into the bladder, but the latter's percentage does not include cases of obliteration of the os uteri.

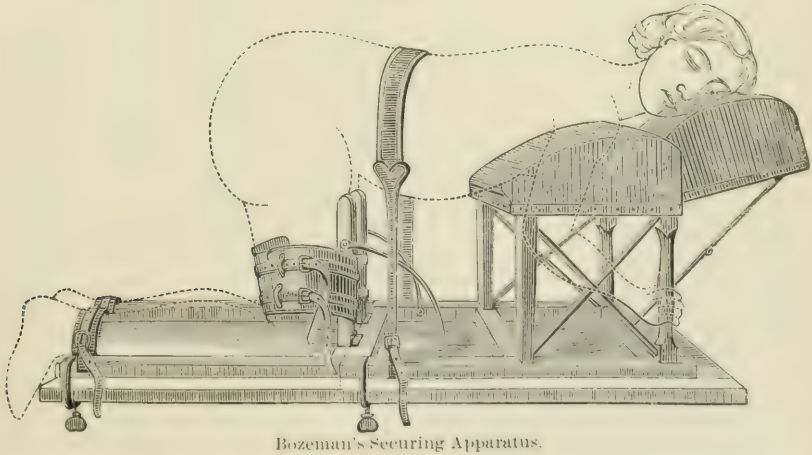
Bozeman explains Simon's high percentage by asserting that the latter "understood thoroughly the value of kolpostenotomy as a means of immediate exposure of the fistule concealed in the vulvo-vaginal tract in simple cases, but he had no conception or appreciation whatever of the value of the combination with it of kolpoecpetasis as a means of gradual and certain exposure in the graver cases."[1]

After the constricting bands are cut a process of gradual stretching is begun by means of compressed sponges in an oil-silk bag or by a glass or vulcanite plug. After a certain amount of dilatation other cicatricial bands may be found to interfere, which are also to be severed. This stretching of the canal is continued until not only is the obstruction to view removed, but a laxness of the walls is obtained sufficient to allow the edges of the fistule to be brought together without the slightest tension upon the line of union.

The Operation.—The instrument and appliances used are—Bozeman's securing apparatus; Bozeman's perineal retractor or his self-retaining speculum; fistula-knives and curved scissors; tenacula; straight needles; Bozeman's needle-holder; a button-shaper; a button-adjuster; a suture-adjuster; a shot-compressor; a fork; perforated shot; silver wire and silk.

Bozeman in seeking to simplify his procedure has aimed to have as little assistance as possible. With this object in view he devised his

FIG. 107.



Bozeman's Securing Apparatus.

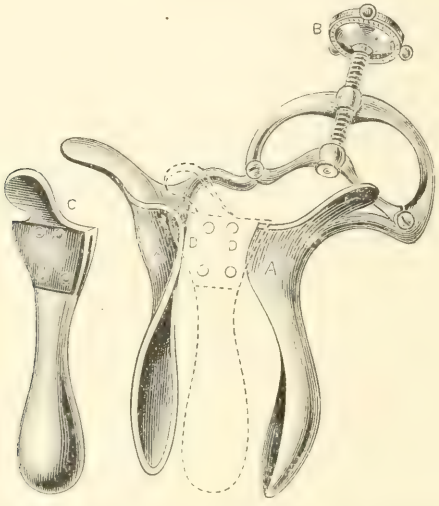
self-retaining tri-valve speculum and his securing apparatus. By the latter the patient is maintained firmly but comfortably in the knee-elbow position, which is the one adopted by him.

[1] *Trans. Am. Gyn. Soc.*, 1881, p. 171.

If the self-retaining speculum is used, only two assistants are required, one to administer the anæsthetic and another to hand the instruments and sponge; if the duckbill speculum is used, which differs from Sims' only in being more deeply hollowed out, a third assistant is needed.

To adjust the self-retaining speculum the vagina is distended by means of the two lateral blades, after which the third or posterior blade

FIG. 108.



Bozeman's Self-retaining Speculum, used in operating on vesico-vaginal fistula: A A, lateral blades; B, screw for separating the blades; C, posterior blade; D D, posterior blade in place.

is fixed in place if it is needed; the last does not always sufficiently elevate the posterior wall, and it is then necessary to use a special retractor.

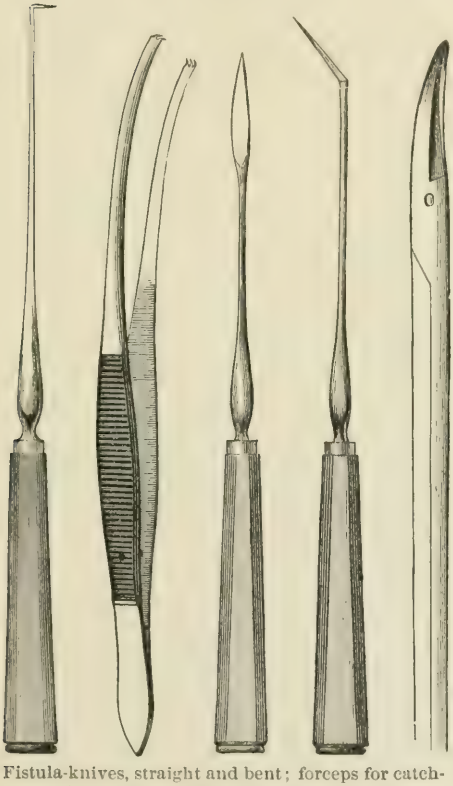
The uterus is never dragged toward the vulva, but the fistula is operated upon *in situ*. The edges are caught up by a tenaculum and pared with a fistula-knife which has its short blade on a plane with its long handle or bent obtusely to the right or left. The margins of the opening are bevelled, but not so much as in Sims' denudation. The angles of the fistule are carefully trimmed with scissors.

After the edges are properly prepared, the silver sutures are to be introduced in the usual way by attaching them to a loop of silk. The stitches are passed through all the tissues of the septum except the vesical lining, which is avoided by bringing the needle out just above it. The sutures are placed, usually, some less and not over half an inch from the freshened edge, and about a quarter of an inch apart. The spear-shaped needle is used; the needle-holder consists of a steel clasp with a long shaft and a flexible canula for approximating the branches of the clasp. The parts which grasp the needle are grooved in several

directions in order to hold it firmly and allow it to be placed at different angles.

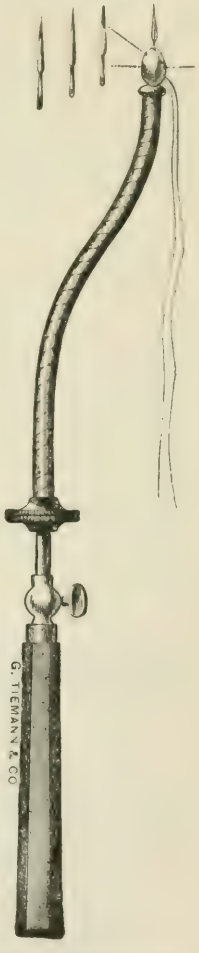
The ends of each suture are put through the adjuster, which is pressed down upon the line of union, while at the same time gentle traction is made upon the wires, thus bending them in the way to produce perfect coaptation after the adjustment of the whole apparatus. Knowing now what the size and shape of the fistule will be when it is drawn together, the metal button is cut

FIG. 109.



Fistula-knives, straight and bent; forceps for catching and scissors for trimming edges.

FIG. 110.



Bozeman's Needle-holder.

to correspond. With scissors and knife it is cut out of a thin sheet of lead, holes punched to agree in number and direction with the sutures, and brought to the desired concave form by suitable forceps. The wires are then passed through the holes in the button, which is pressed down firmly and adapted to the parts by the button-adjuster. Shot are slipped upon the ends of the wires down to the button, and after the sutures

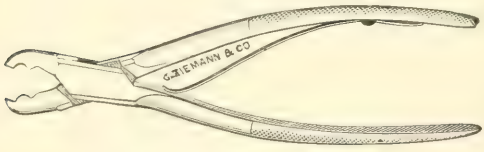
have been drawn up securely each shot is compressed tightly by a strong forceps upon the wires, which are then clipped off rather close and the ends bent over.

Fig. 111.

Bozeman's Suture-adjuster.

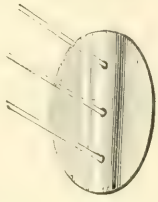
A straight line of union is by far the best, but the shape of a fistule at times is such as to render this impossible: in this case the button must be cut, bent, and perforated to conform to the line of closure.

Fig. 112.



Bozeman's Button-shaper.

Fig. 113.



Wires passed through the Button.

The apparatus is not allowed to remain longer than the tenth day, and is usually removed on the seventh. To do this, clip the wires with

Fig. 114.

Button-adjuster.

long curved scissors between the shot and the plate, take off the latter, and draw out the sutures.

An ordinary English catheter is kept in the urethra, and opium enough administered to quiet pain. In general, the after-treatment does not differ from that of other gynecological operations.

Fig. 115.

Button, wire, and shot Compressed.

The advantages claimed for this method are—

1st. The plate gives the margins complete rest, and supports them in such a manner as to maintain them exactly in the plane in which they were united.

2d. The line of cicatrization is protected from the urine and vaginal secretions.

3d. "The independent action of each suture renders parallelism unnecessary, and thus gives the operator the liberty of introducing them in whatever direction may best suit his purpose."

Fig. 116.

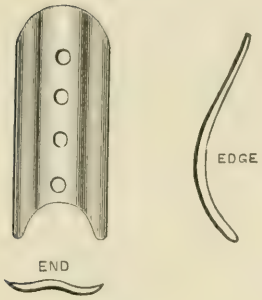


Fig. 117.

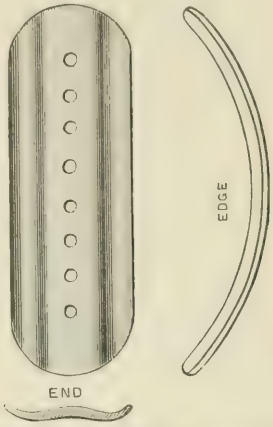


Fig. 116.—Shape of Button for Urethral Fistule: notch in the end to accommodate and support a catheter, which is introduced before the button is adjusted (Bozeman).
Fig. 117.—Button for Fistule, just above neck of bladder, curved for arch of pubes.

4th. The position of the patient and the mode of exposing the fistula are such that the operator requires but little assistance.

Fig. 118.

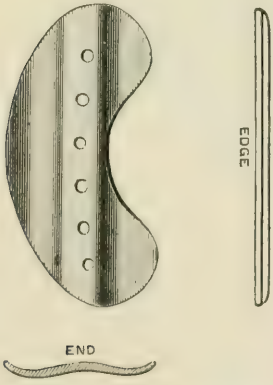
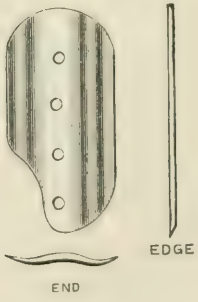


Fig. 119.



Buttons adapted to Fistules lying near or involving the Cervix Uteri: Notch for the Cervix.

This procedure has been very successful in the skilful hands of its deviser, and many American as well as English, Scotch, and French operators have practised it. Since 1857, however, when Sims advocated the use of the simple interrupted silver suture on account of greater ease of application combined with equal or wider usefulness, operators have

gradually but quite generally relinquished both the "button" and "clamp" suture to adopt the simpler one.

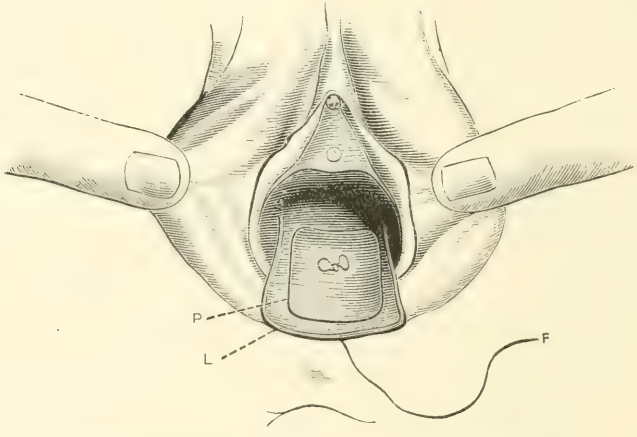
Transplantation.—A method of treating vesico-vaginal fistula by this procedure was introduced to the profession in 1834 by Jobert (de Lamballe) under the name of elytroplasty, an operation upon the same principles as rhinoplasty. It has been employed by several operators, principally French, who have varied it by obtaining the flap from diverse localities and using different methods of retaining it in place.

The edges of the fistula having been freshened, a flap is dissected up from the inner surface of the labium, buttock, or thigh, its bleeding surface applied to the fistula, and fastened there by sutures. A catheter is maintained in the bladder during the process of union.

A premature section of the flap at its base has caused the operation to be a failure; Jobert reported one case of non-success from this cause, gangrene setting in on the twelfth day.

Velpeau[1] obtained the flap from the posterior wall of the vagina opposite the fistula by making longitudinal parallel incisions and dissecting up the tissue between them. This was sutured to the previously

Fig. 120.



Autoplasty by a Flap taken from the Recto-vaginal Septum opposite: F, suture; P, metallic plate for supporting the flap; L, flap (Leroy d'Étiolles).

vivified margins. Leroy d'Étiolles[2] procured a flap from a point somewhat lower. A transverse incision was made below the fourchette; two longitudinal incisions met this at right angles; raising the tissue within

[1] *Nouveaux Éléments de Médecine opératoire*, 2d ed., 1839, vol. i. p. 702, and vol. iv. p. 446.

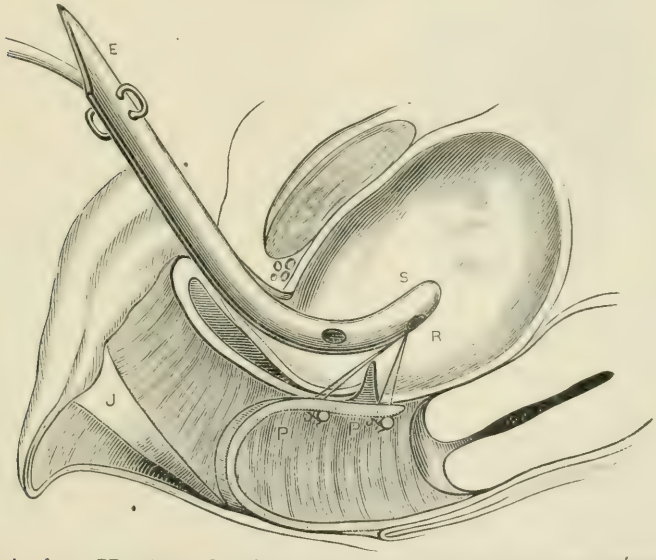
[2] *Mémoire sur un nouveau Traitement des Fistules vesico-vaginales*, presented before the Academy of Sciences, Aug., 1842.

these lines, a quadrilateral flap was obtained which was rolled upon itself and its bleeding surface applied to the fistula.

At the present time the tissue to be transplanted is obtained in much the same manner as was done by Velpeau and Leroy d'Étiolles; but our increased surgical facilities and improved methods of exposing the fistula allow the flap to be secured to its place by sutures more firmly and satisfactorily than either of the above-mentioned surgeons, or Jobert even, was able to do.

Theoretically, transplantation in some form would seem particularly applicable to those fistulæ in which there is great loss of substance, but practically it has seldom been found so. The difficulties attending its performance and the uncertainty of its results have caused it to be

FIG. 121.



Flap in place. PP, sutures; S, catheter; R, opening in the catheter (Leroy d'Étiolles).

superseded by other simpler and more reliable procedures which the surgery of these days offers.

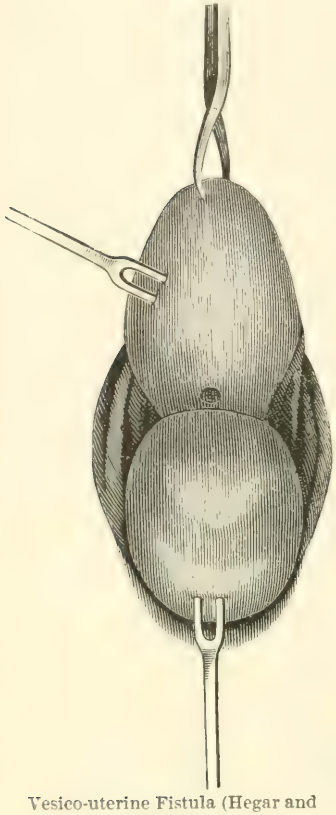
LESS FREQUENT FORMS OF FISTULÆ AND THOSE DEMANDING SPECIAL TREATMENT.

VESICO-UTERINE FISTULA.

In this a communication exists between the bladder and the uterine canal without external alteration of the cervix. It is usually in the form of a small sinus situated near the junction of the body and neck of the uterus. It would be improbable that a fistula could occur much above this locality without an early fatal result, from the escape of

urine into the peritoneal cavity, unless the opening were caused by a pelvic abscess opening simultaneously into the bladder and uterus.

Fig. 122.



Vesico-uterine Fistula (Hegar and Kaltenbach).

If urine is seen to issue from the cervix, it is fairly safe to conclude that there is a vesico-uterine fistula, but the possibility of that rare form, uretero-uterine fistula, occurring, must also be borne in mind; for, should it be the latter and the operator have performed hysterokleisis on the supposition that it was the former, the violent symptoms of hydronephrosis and uræmia would shortly ensue.

Jobert approximated the true method of treatment when he split the neck transversely until the fistulous opening was revealed, vivified the edges of the fistula, and united them with sutures. The two sides of the cervix which had been separated by the incision were then allowed to fall together by their own weight, but were not secured by sutures.

Fig. 122 illustrates a case operated upon by Kaltenbach, in which he split the cervix beyond the vaginal junction, dragged it down by hooks, made a steep, oblique freshening of the fistulous margins longitudinally, and introduced seven sutures to coapt them.[1]

In spite of the great number of cases under his observation and treatment, Simon operated only once by direct closure of the fistula. This he was able to accomplish without splitting the cervix, and Spiegelberg and Lassen have done the same.

Martin and Lassen dragged the fistula down by a catheter introduced through the urethra.

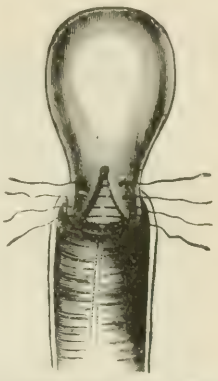
It has long been thought that the basis of proper treatment would be the reproduction of the original injury, which, as first pointed out by Emmet, is a laceration of the cervix extending into the bladder. The rent heals below, leaving a fistulous opening above; and this is the condition which presents itself to the operator. It is a rational theory, and success has attended its practical application.

The anterior lip is slit up to the fistula; the edges of the latter are

[1] Hegar and Kaltenbach: *Die Operative Gynäkologie*, p. 623.

freshened longitudinally. The whole is then brought together by sutures in much the same way as in simple laceration of the cervix. Great care is observed in the insertion of the upper sutures in order to ensure the closure of the fistula.

Fig. 123.



Cervix Slit to Expose the Fistula and Sutures Passed.

The following novel procedure has been practised by Folet (of Lille) when the fistula is situated at the junction of the neck and body of the uterus: He dilated the urethra to a diameter of 22 millimeters with a Dolbeau dilator; then dragged the cervix to the vulva. Placing one finger in the bladder as a guide and support, he dissected the bladder from the uterus through the vagina until he reached a point a little above the vesico-uterine communication; then, bending the finger toward the rectum, he brought within access the fistulous opening in the bladder, which was closed with four Lembert sutures. The fistula was cured, but a persistent incontinence resulted from the too sudden and extensive dilatation of the urethra. The latter circumstance, however, does not destroy the value of the procedure, since it is by no means a constant sequence of dilatation of the urethra. The operation is said to be both easy and expeditious.[1]

Cure of vesico-uterine fistula has been obtained by Simpson, Spiegelberg, and Polaillon through cauterization with the solid stick and with the actual cautery.

Cases of spontaneous closure have been reported;[2] indeed, Michaelis and Martin consider that this is not of infrequent occurrence.

Should the aperture be much above the vaginal junction—that is, so situated that the incision and the freshening would endanger the peritoneum—direct closure must be abandoned, and indirect closure by hysterokleisis be resorted to. This necessitates menstruation through the bladder, and is followed by sterility. The vesico-uterine passage being usually narrow and sometimes crooked, uterine colic may occur after hysterokleisis, and the uterine contractions have been sufficiently violent to rupture the cicatrix.

Vesico-utero-vaginal Fistula.

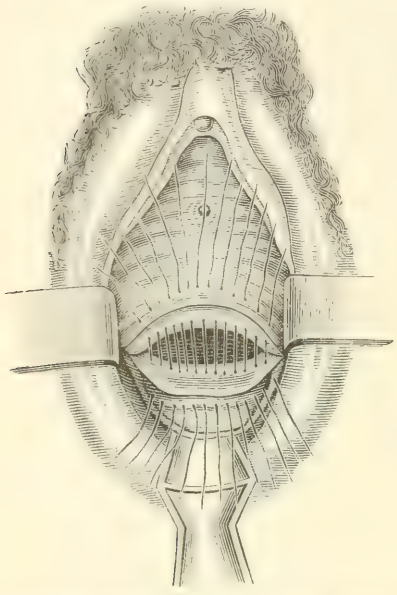
This class includes several conditions which vary from a simple laceration of the cervix and vesico-vaginal septum to total destruction of the cervix.

[1] *Soc. de Chir.*, June, 1886, and *Dict. des Prog. Sci. méd.*, 1886.

[2] Polaillon: *Bull. de la Soc. de Chir.*, 1876. Nos. 4 and 5; Bouqué: *op. cit.*

If there is a rent uncomplicated by the malformations resulting from sloughing, no difficulty will be found in freshening and uniting the edges by sutures, except it is in placing the two or three sutures which must pass through both the vesical wall and the cervix in case of a longitudinal fistula. These latter are to be introduced deeply and carefully, in order to ensure union of the septum adjacent to the cervix, where a small opening is liable to remain after the rest is healed.

FIG. 124.



Vesico-utero-vaginal Fistula, anterior lip pared (Monteros).

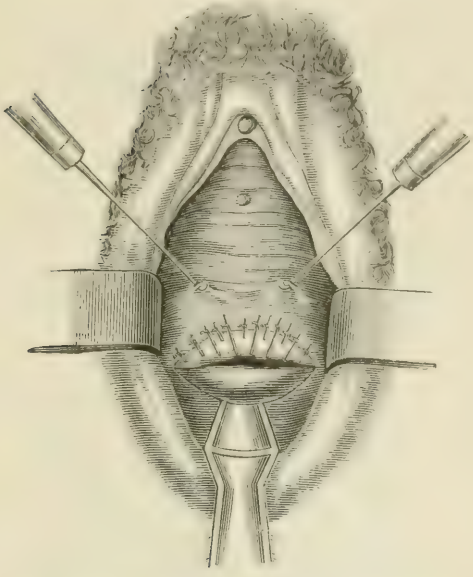
In rare instances the cervical tear extends beyond the fistula. The injury to the cervix must be repaired in order to secure closure of the fistula by the direct method. Dr. Bozeman, who seems to have been the first to point out the proper treatment, makes two operations.

In most cases in which the cervix is involved some portion of it has been destroyed by sloughing. If a part of the anterior lip remains sufficient to coapt with the posterior edge of the fistula, it is pared and united with the freshened posterior margin.

In cases where the anterior lip has been so extensively destroyed as not to admit of closure in the preceding manner, the inferior border of the fistula may be united to the posterior lip of the cervix. The menstrual fluid will then be discharged through the bladder.

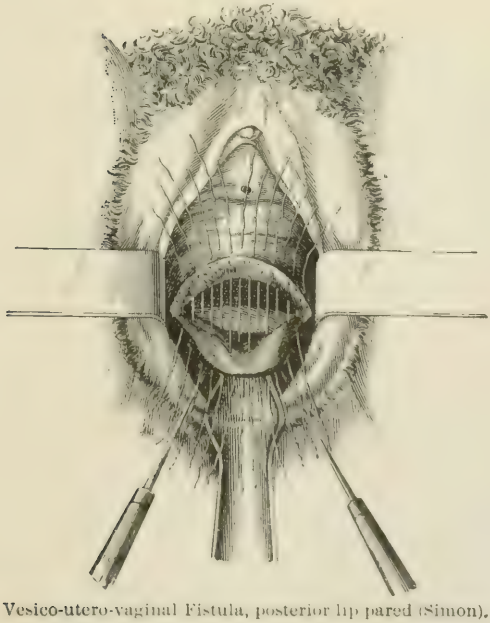
Though sterility is the rule after the last procedure, still pregnancy has been known to occur. Deroubaix relates the history of such a case in which he had performed hysterokleisis for vesico-utero-vaginal fistula. Subsequent examinations showed that a small aperture at the middle of the cicatrix remained, which barely admitted a fine probe that passed toward the bladder; but there was no leakage from the orifice when water was injected into the bladder. The woman declared that, ordinarily, there was no incontinence, though she lost a little urine if she waited much beyond her usual time of evacuation. Menstruation took place through the bladder without inconvenience. About a year after she again presented herself in a worse condition than she was previous to her operation. The explanation was that pregnancy had supervened, which ended in miscarriage between the third and fourth months.

FIG. 125.



Vesico-utero-vaginal Fistula, sutures in place (Simon).

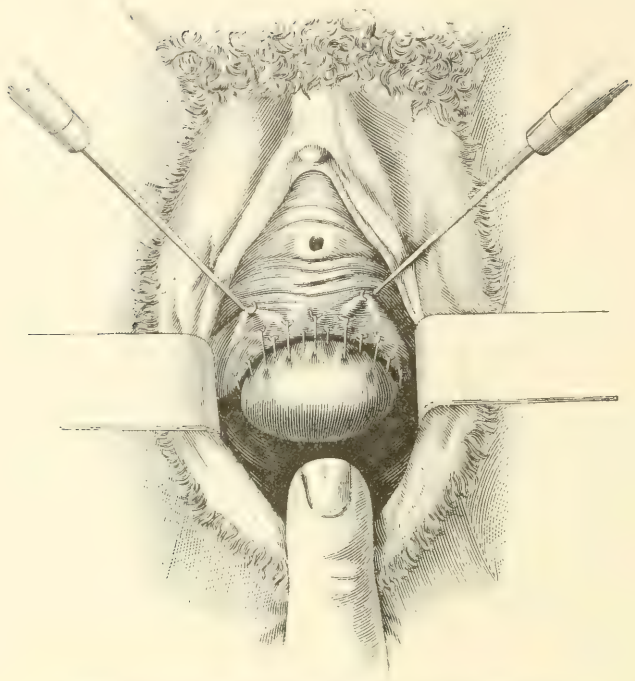
FIG. 126.



Vesico-utero-vaginal Fistula, posterior lip pared (Simon).

A peculiar feature of this was that the fœtus first passed into the bladder, and one arm had even been extruded through the urethra, but after

Fig. 127.



Posterior Lip united to Anterior Edge of Fistula (Simon).

ward the whole was expelled by the vagina. The patient's statement was confirmed by the physician who delivered her.[1]

This practice of utilizing some portion of the uterine neck as an anterior border of a vesico-utero-vaginal fistula is another example of Jobert's skill and ingenuity. These methods of closure have been modified and improved by Emmet and Bozeman, but more especially by Simon, by whom brilliant results have been accomplished.

Urethro-vaginal Fistula.

An abnormal opening in the urethral canal is usually the result of laceration. Unless the neck of the bladder is involved, incontinence is not a sequence, but at the time of micturition the urine is poured out into the vagina, the effect of which is to produce disturbances serious enough to cause the patient to look upon the defect as a misfortune.

The denudation should be extended upon the vaginal surface in order to procure a sufficient breadth of uniting surface, as the urethral walls are not only thin, but, containing erectile tissue, are easily cut through by the sutures. The line of union should be in the longitudinal axis

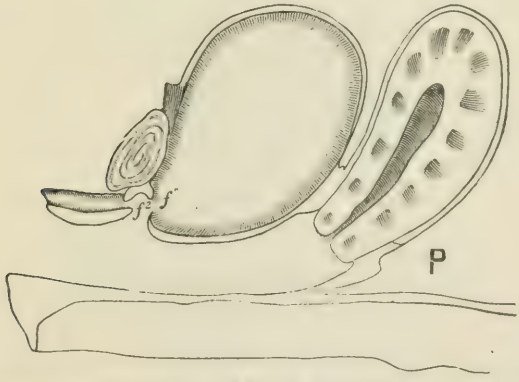
[1] Deroubaix: *Fistules uro-génitales de la Femme*, Obs. xx.

of the canal, that the subsequent contraction of the cicatrix may not cause any constriction. The sutures are of finer wire than is ordinarily used, No. 30, and are introduced over a catheter. It is more necessary that the wires lie parallel and emerge at a like distance from the edge in this case than in that of some other fistulæ. The sutures may penetrate the entire thickness of the urethral wall, emerging in the canal if it is necessary in order to get a firm hold; the wire-holes will take care of themselves unless a suture cuts out. Should there be much traction on the stitches, lateral incisions may be made at a little distance from the line of union.

Cases are met with, though seldom, in which there is atresia of the upper portion of the urethra, accompanied by a vesico-vaginal fistula, situated just above the neck of the bladder. Jobert, Roser, and Neugebauer have observed cases of this sort, and operated upon them by penetrating the atresia with a trocar and maintaining perviousness by increasing sizes of catheters. Simon has also employed this method, but, on account of the tendency of the dense scar-tissue, through which the opening is made, to contract as soon as constant dilatation is discontinued, he preferred to cut away the atresia rather than to penetrate it.

A more complicated condition exists when the urethral atresia is accompanied by two or more fistulæ—a urethral below and one or more vesico-vaginal above—between which lies the section of occluded urethra.

FIG. 128.



A Vesico-vaginal and Urethro-vaginal Fistula divided by an Atresia of the Urethra.

In this variety the atresia cannot be rendered pervious, but must be bridged over. To do this Simon employed one of two procedures: 1st. Uniting the superior border of the vesico-vaginal fistula to the inferior border of the urethro-vaginal fistula. When the vesico-vaginal opening is small and the atresia is short, this method has been successful in obtaining complete continence.[1] 2d. Transplantation of the vesico-vaginal

[1] Simon: *Mittheil. a. d. Chir. Klin.*, 1861-65, p. 136, Case 30.

Fig. 129.

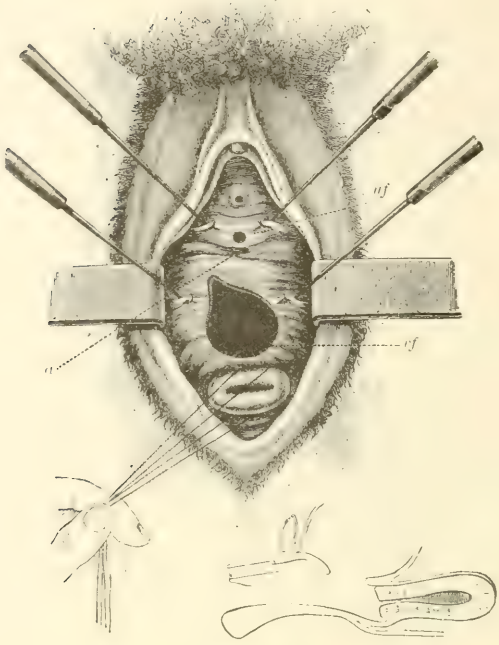
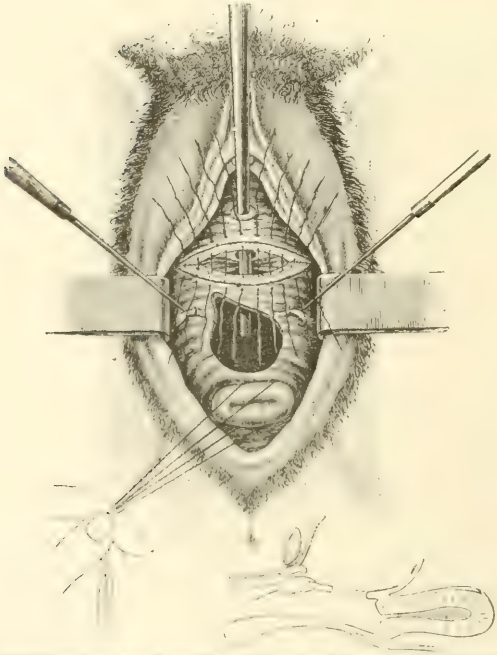


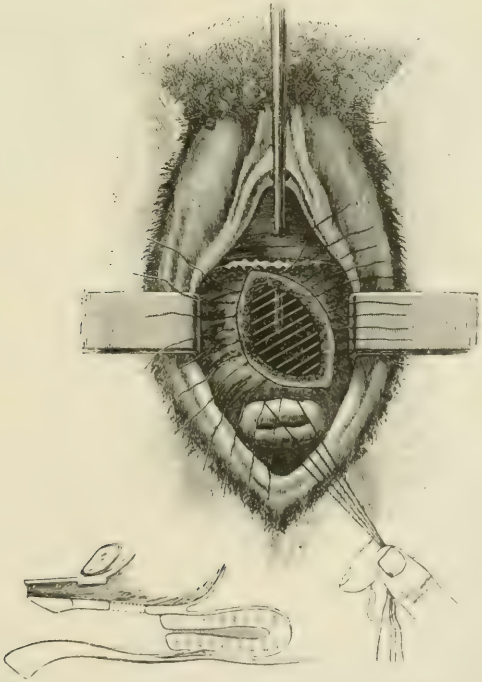
Fig. 130



Figs. 129 and 130.—Bridging over an Atresia and Closing a Urethral Fistula by Transplantation of the Vesico-vaginal Wall (Simon): *a*, atresia; *uf*, urethral fistula; *vf*, vesical fistula

wall on the pervious portion of the urethra. In case the vesico-vaginal fistula is large, union by the preceding method would either be impossible, or if possible would be unsatisfactory in its results: a transverse line of union of edges so widely separated as these draws the already shortened urethra upward in such a manner as to produce persistent incontinence. To avoid this outcome the following method is used: An artificial vesico-vaginal fistula is formed just above the neck of the bladder. This fistula opens into the urethral fistula and into the unoccluded part of the urethra. The superior border of the artificial opening is then united with the pervious portion of the urethra. When healing has taken place the vesico-vaginal fistula above is closed. By this procedure the distance from the superior border of the large fistula

FIG. 131.



Urethral Atresia bridged over; diagonal line of union in closing the vesico-vaginal fistula (Simon).

to the meatus is spared the great shortening which must necessarily follow from direct union, if union were possible, between the upper border of the large opening and the lower border of the urethral fistula.

LOSS OF TISSUE AT THE NECK OF THE BLADDER.—This is the result of sloughing or laceration, but most frequently the latter, which is produced by traction made while the bladder is full. The injury

usually involves both the urethra and the adjacent soft parts between the rami.

The chief difficulty to vivification and introduction of sutures is the prolapse of the hypertrophied tissues anterior to the neck of the bladder. This obstacle may be overcome by passing in a large sound, which not only dilates the urethral canal, but also presses back the prolapsing mass. The sutures are then introduced over the sound.

Fistulæ with Great Loss of Substance at the Base of the Bladder.—This is the result of extensive sloughing, which may have been so great as even to preclude all possibility of bringing the edges in juxtaposition. In these cases the neck of the uterus is utilized to fill the gap. Dr. Bozeman has recommended a procedure by which this may be successfully accomplished. The uterus is dragged toward the vulva daily for several weeks before the operation by seizing the cervix with forceps. Thus the cervix is brought to the opening which it is designed to cover. The anterior lip is then freshened and united by sutures to the position of the septum remaining. Another method is to slit the cervix to the vaginal junction and secure it over the opening by means of sutures.

In cases of large fistula which still have sufficient breadth of border, or where sloughing has not destroyed the laxity of the surrounding tissues so that the edges can be approximated from different directions, it has been found that by varying the course of the line of union, which also varies the lines of tension, they can be closed by immediate coaptation. Simon, who has been successful in the practical application of this principle, has found that the inverted Y-shaped, the bow-shaped, and the T-Y-shaped (⅄) best meet the requirements. The ⅄-shaped line of union is applicable to pointed heart-shaped fistulæ in which the point is at or toward the urethra, the extreme breadth in the anterior cul-de-sac, and the indentation in the median line, usually at the cervix. The edges from the urethra back to the cervix are brought together in the longitudinal axis. The posterior portion of the fistula is then united transversely to this, the cervix being in the middle of the line of union and situated at the junction of the stem with the branches of the ⅄.

The ⅄-shaped union is adapted to fistulæ in form resembling an oblong or square.

At first, Simon performed the operation in one, two, or three sittings. Afterward, however, he adopted the plan of operating upon the whole, at one sitting *by sections*—namely, vivifying and uniting one portion before beginning another. The advantages of the latter method are—a saving of time both in the performance of the operation and in the period of recovery; a part of the fistula having been closed, the remain-

der is brought together with greater ease and exactness, since all the parts have approached each other.

This method by broken line of union has made direct closure pos-

Fig. 132.

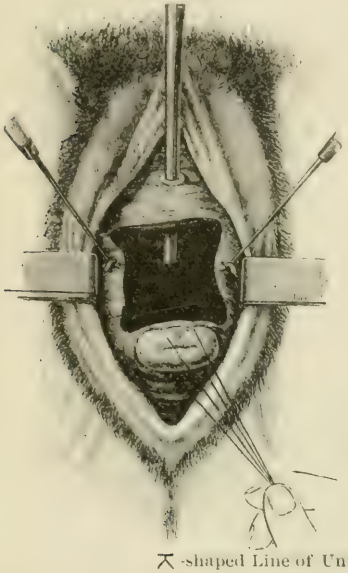
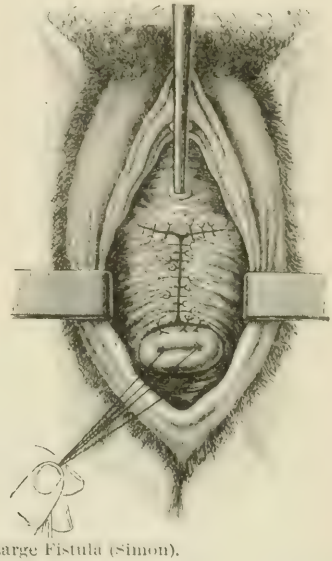


Fig. 133.



⊼-shaped Line of Union in a Large Fistula (Simon).

sible in fistulæ otherwise not amenable to treatment, except indirectly by occlusion of the canal.

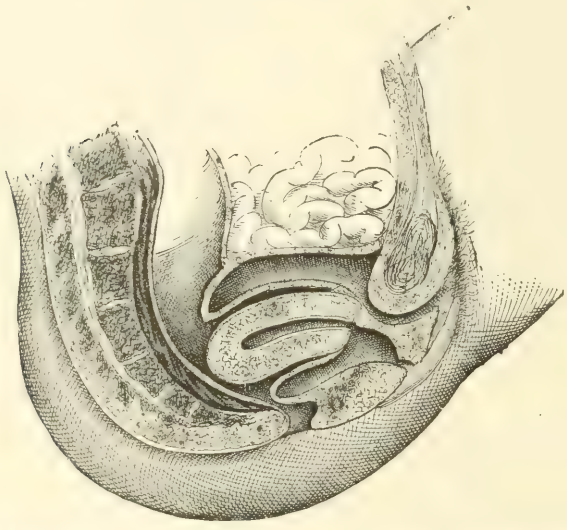
Obliteration of the Urethra as a Complication of the above.—Along with a considerable loss of the septum there may be absence of the neck of the bladder and a part or whole of the urethra. In these cases a closure of the opening does not always ensure continence. However, if the abundant loose tissues about the neck of the bladder have not sloughed away, continence may be obtained although there is no true sphincter.

When only the neck of the bladder or the upper portion of the urethra is destroyed, the uterus may be dragged down to fill the gap in the septum and the cervix be united to the stump. But unless the urethra is so united to the cervix that the latter is made to press forward against the pubes as the bladder rises with the accumulation of urine, there will be incontinence. To obtain the desired mechanical action of the cervix, the urethra must be united to the anterior lip just forward of the os. Should the remaining portion of the urethra be short, or should it be much drawn back by its union with the cervix, it then simply acts as a straight and open drainage-tube through which the urine constantly escapes. This condition will necessitate lengthening the urethra anteriorly—a remedial procedure employed by Emmet for

these cases. Prolonging it beyond the normal opening results in a forward and finally upward curve which causes the urine to be retained till it has risen as high in the bladder as the new position of the external end of the urethra.

Should total obliteration of the urethra be another addition to the rather chaotic state of things generally found in the class of cases under consideration, then, truly, to attempt restoration both patient and operator must possess an immense stock of patience in order to

FIG. 134.



Cervix uteri united to the Neck of the Bladder to Secure Retention (Emmet).

endure the time and tedium required to accomplish what is a brilliant victory in modern plastic surgery.

To form a new urethra two parallel strips are vivified on either side of the median line. The undenuded portion between the freshened strips is of sufficient width to form a canal of normal diameter. The vivified surfaces are united over a catheter by means of fine silver sutures which are secured either by twisting or by compressing a shot upon each one. The point of communication between the bladder and the new urethra may be at one of two places—high up on the septum or at the most dependent portion.

It was formerly thought necessary to select the former point, so that the traction produced by the bladder rising in the pelvis as the urine accumulates would close the canal before the urine had risen high enough to flow into it. The chief objection to this plan is that the pouch existing below the urethral opening is not always properly emptied, hence there is ever the danger of a collection of stale urine.

This necessitates daily washing out of the bladder. Emmet has recommended a method by which to avoid this difficulty. The urethra is made to open into the bladder at its most dependent portion, and the anterior part of the canal is extended for some distance beyond the normal position of the meatus. The lines of incision diverge as they approach the bladder in such a manner as to form, when united, a trumpet-shaped canal, the expanded end being next to the bladder. This serves a twofold purpose—to maintain continence and to start the flow of urine. This may appear paradoxical at first thought, but it does not when the mechanical principle involved is understood. When the canal is empty the front and back walls of the expanded portion fall upon each other, forming a somewhat triangular body, the base toward the bladder and the apex running out into the lengthened urethra. As the bladder begins to rise out of the pelvis with the accumulation of urine, the tractile power which emanates from this base to be concentrated along the extended apex is much greater and more efficient in drawing the urethra close behind the pubes than in a uniform canal. In the former there is a tendency to centralize the force upon a circumscribed space, while in the latter a lesser force is spread along the entire length.

The expanded portion also assists in opening the canal in this way: contraction of the abdominal muscles forces urine into this part or compresses what is already there, giving to it a wedge action that opens the narrow part of the canal enough to start the stream, which will be continued by pressure of the body of fluid above.

This theory, which has also been found to work very well in practice, is based upon reasonable principles, as are the other operative procedures of this able elaborator and eminent authority upon the operation for fistula.

Fistulæ in Difficult Situations.

A small fistula seated immediately in front of the cervix will frequently prove troublesome to the operator. The neck of the uterus is made to serve in the closure of these fistulæ as well as in those which involve a considerable portion of the septum. They are best treated after the plan advised by Emmet. A V-shaped piece is removed from the cervix, but without opening into the canal. The freshening of the edges extends a considerable distance on the vaginal surface, with a long angle at the upper end. Sutures are introduced transversely to the axis of the vagina. The particular evil to be feared is a small sinus remaining at one or both ends of the line of union; therefore the operator should take especial care to procure sufficient width of coapting surface and length of angle. If a sinus remains, it will

probably be at the cervix end of the line of union, and will be a long and very narrow one, usually extending upward along the uterine neck. The difficulty of freshening in the ordinary manner is such as to lead Thomas to adopt another plan. The apparatus used is what dentists call a dental engine, to which is attached a small burr with cutting flanges. When an assistant, by means of the treadle, has caused the burr to revolve rapidly, it is passed along the sinus until the operator is satisfied that it is thoroughly freshened. Deep sutures are then passed to bring the vivified surfaces together. Thomas declares that he has cured by this means several fistulæ just in front of the cervix which would otherwise have been very hard to close.

Fistulæ Situated against the Rami of the Pubis.—There is no variety of vesico-vaginal fistula which is more difficult of access and which tries the operator's manual dexterity and surgical skill more than this.

A fistulous opening in the above location is usually large, extending toward or beyond the median line and involving a considerable portion of the septum. It is often somewhat triangular in shape, with the base resting upon the ramus. In these cases there must be two lines of union—one perpendicular to and approaching as near the ramus as possible; the other crossing the first and parallel with the bone. In other words, the lines form a T.

Even in those fistulæ which do not have a broad base upon the bone, there is nearly always a small opening which cannot be closed except in a line transverse to the main one; and for this reason, although there is no base against the bone, there can also be no properly-formed angle. After the main line of union has healed the operation for closing the aperture against the ramus may be undertaken, and for this it is best to place the patient in the knee-elbow position.

If there is enough tissue remaining upon the face of the bone, it is dissected up to form one edge of the fistula. This is done with scissors, or, if extensive, with the handle of a scalpel, in order to avoid cutting an artery which passes along the inner edge of the ramus; if severed, a troublesome hemorrhage may ensue. To facilitate dissection, the flap is held tense by a spring tenaculum. On account of the exceedingly narrow space in which to turn a needle, introduction of the silk loops becomes a difficult matter. Emmet has found that the best way is to pass two loops through the edges at opposite points, each from within outward; then put one loop through the other, draw it through, and thus cause one loop to pass through both edges. Having once introduced the silk, the wire is easily lodged in place.

As a last resort when the tissues upon the inner surface of the ramus are gone, a flap may be dissected from the vagina above and made to cover the opening. The mucous surface is turned toward the bladder.

Ureteral Fistulæ.

Uretero-vaginal.—The most common location for this infrequent form of fistula is in the vaginal cul-de-sac a little posterior to the cervix. The connection between this lesion and pelvic cellulitis has been spoken of under the head of Causes. The necessity of evacuating the bladder naturally at stated periods shows that but one ureter is involved.

If the fistula is the result of an abscess which has opened simultaneously into the vagina and the bladder, and it can be ascertained that a canal or cavity still remains with which both the renal end of the ureter and the bladder have communication, the vaginal opening can be safely closed. Whether this state of things exists may be determined by the following method: Let some colored fluid be injected into the empty bladder, and if the urine constantly flowing from the uretero-vaginal fistula suddenly becomes colored and doubled in quantity, there is an opening through which the fluid overflows when it has reached the required height in the bladder. Unless the above signs manifest themselves, it is not safe to close the vaginal side of the opening, except the operator satisfy himself as to the existence of a passage by exploratory means of a more radical sort.

Although the diagnosis usually turns upon this point, it has been known to mislead. Levrat has mentioned an instance: In 1879 he saw in Duplay's service a case of uretero-vaginal fistula; milk injected into the bladder escaped by the fistula, and therefore it was considered justifiable to apply the suture. The case terminated fatally, and an autopsy revealed the fact that the ureter alone was involved.[1]

The relations of the ureter to the opening in the bladder and the position of the latter can usually be determined by two probes, one passed into the fistula to meet the other introduced into the bladder through the urethra or through an incision made into the bladder above its neck. In a case where there was difficulty in finding out the exact condition Emmet laid open the septum from just above the neck of the bladder to a point near the cervix uteri, and, having assured himself as to the state of the bladder, the location of the opening into it made by the abscess, and the relations of the ureter to the vesical opening, he afterward successfully closed both the vaginal end of the uretero-vaginal fistula and the artificial vesico-vaginal fistula, having utilized the tract of the old abscess, which had been kept pervious by the urine, to convey the latter from the renal portion of the ureter into the bladder.

After the ureter is severed the vesical end of the tube usually becomes impervious; therefore, unless there is a solution of continuity in the bladder-wall, as just mentioned, the ureter may be said practically to

[1] *Nouv. Dict. de Méd. et Chir.*, vol. xxxviii. p. 213.

communicate with the vagina only, and operative procedures must be regulated accordingly.

Simon's first attempts in treatment were to render the vesical portion of the severed ureter permeable, and then to close the vaginal side of the fistula; but the operations were followed by violent symptoms of retention of urine and the vaginal wound reopened. He therefore, with others, entertained the opinion for a long time that cure was to be obtained only through an indirect method—namely, kolpokleisis, with previous establishment of a vesico-vaginal fistula. The inferior edge of the artificial fistula was to be united to the posterior vaginal wall, or the anterior and posterior walls joined just below the vesico-vaginal fistula. Later, however, he advocated perforation of the bladder at the site of the fistula, and that the ureter might not be occluded by closure of the original fistula its anterior wall is slit up. To do this a sound is passed from the bladder through the artificial opening into the ureter, upon which the uretero-vesical wall is cut (from the bladder) one-fourth to three-fourths of an inch. The ureteral slit is kept open by the daily passage of a large sound. After the edges have healed the vaginal fistula is closed. By this method the mouth of the ureter is removed to a sufficient distance to ensure it against being included in the deep sutures which close the vaginal wound.

Henry F. Campbell of Georgia has obtained a perfect and speedy cure by a similar though simpler procedure. A small bistoury was passed into the ureter, slitting its anterior wall and penetrating the bladder. The vaginal surface about the opening was then vivified, and coapted by silver sutures. The first successful case, in this country at least, was recorded in 1867 by Dr. T. Parvin.[1] With a trocar he formed a new channel into the bladder for the ureter. He made a superficial vivification of the vaginal surface and a portion of the anterior lip of the cervix, and was thus able to suture the vaginal side of the opening without encroaching upon the lumen of the ureter.

It is seldom that the above procedures would be unsafe, since the ureter either opens at the spot where the vagina and bladder lie in close proximity, or if at a high point there has been sloughing and pelvic inflammation, by which adhesion is caused between the vagina and bladder. Should a fistula occur under neither of these circumstances, and therefore perforation of the bladder not be allowable, the following device of Emmet is to be considered: The ureteral canal is extended down the vagina by the same method that a new urethra is formed, until the point is reached where the vagina and bladder approach each other nearest. Here a circular or oval opening is cut in the vesico-vaginal septum, and after the edges have healed a flap dissected from the vagina is made to cover it and the end of the artificial canal.

[1] *Western Journal of Medicine*, vol. ii., 1867.

Emmet has recorded a partial success by this method. The patient unfortunately died of an intercurrent affection just before the time set to complete the work—namely, to effect communication between the artificial ureter and the bladder.[1]

Variations in the mode of procedure with these fistulæ have arisen through Landau's proposition to employ catheterization of the ureter. He introduced a soft catheter into the renal end of the ureter through the fistula, then passed the lower end of the catheter through the vesical portion of the ureter into the bladder, and drew it out through the urethra with forceps. The fistula is then vivified along the exposed section of the catheter. The denudation includes both the vaginal mucous membrane and the lower side of the ureter, and is a long oval extending obliquely. The edges are brought together over the catheter, which is allowed to remain till union has taken place.

Should the parts fail to unite, it is recommended that the original fistula be converted into a vesico-uretero-vaginal fistula. An oval piece extending in the same direction as the lower portion of the ureter is excised from the vesico-vaginal septum. The oval is so placed that the ureter will open into its upper end. Deep sutures which include the vesical mucous membrane are then introduced.

The chief dangers that beset these operations are—1st, occlusion of the ureter by one of the deep sutures; 2d, rupture of the cicatrix by the removal of the catheter.

Bandl operated after a modified form of Landau's mode, but effected cure only after several operations. One failure was due to the first of the above-mentioned possible sequences, the symptoms of retention being so severe that he was obliged to remove the sutures. Hahn employed this method once without success.

Pawlick encountered the second cause of failure, the result of incrustations which had rendered the catheter rough, so that some force was required to dislodge it. In the second operation he employed a long olive-tipped, metallic catheter, which he introduced into the ureter through the urethra and bladder.[2]

Congenital malposition of the ureter is of rare occurrence. Emmet, with his large experience, mentions having observed but one case. Dr. W. H. Baker of Boston has published the cure of a case in which the ureter terminated upon the vaginal surface near the meatus urinarius. He first dissected up the ureter, and, having decided to turn it into the bladder as near its normal point of communication as possible, he next dissected up the vaginal mucous membrane to the left of the median at a point one inch from the internal orifice of the urethra, where he opened into the bladder. After the superfluous length of ureter was

[1] Emmet, *Prin. and Prac. of Gyn.*, p. 851, ed. 1884.

[2] *Archiv f. klin. Chir.*, vol. xxxiii. p. 717, or *Dict. des Prog. des Sci. méd.*, 1886.

cut off the end was placed in the bladder and its edges sutured to the vesical lining; the threads were cut off short and left to ulcerate out into the bladder. The wound on the vaginal surface was then brought together with five silver sutures. The wires were removed on the eighth day, when union was found to be complete, and the threads passed off later with the urine.[1]

Lest a calculus should form upon the raw surface to be turned into the bladder, as happened afterward in the case just mentioned, it should first be allowed to heal, then placed in the bladder, and the vivified vaginal wall brought together over the opening.

Uretero-uterine Fistula.—This exceedingly rare form may be confounded with vesico-uterine fistula, from the fact that in both urine is seen to issue from the uterus. It will be observed, however, in the latter that the position of the patient makes no difference with the flow, as it does with fistulæ of small size communicating with the bladder at a high point; that if the patient evacuate the bladder, then the escaping urine be caught by a urinal or by seating her on a vessel for a stated period, and at the end of the time the urine in the bladder be drawn, the amount which was lost by the uterus and that obtained by the catheter will be equal; that the urine continues to flow when the bladder is kept empty by a permanent catheter in the urethra. But the diagnosis turns upon the point that, as a general rule, when colored fluid is injected into the bladder the urine flowing from the os still remains clear, thus showing that the two do not intermingle.

The small size of these fistulæ and their difficult situation render it almost impossible to define their location or to operate upon them by other than indirect methods. It has been thought possible to convert a uretero-uterine fistula into a vesico-utero-vaginal fistula by an incision extending from the fistula forward into the bladder. Closure is then to be effected as in the vesico-utero-vaginal variety. The uterine end of the opening is so small that it could scarcely be found with a probe, consequently the cervix would usually have to be split up to carry out this plan.

Another method of treatment is by kolpokleisis, with the previous establishment of a vesico-vaginal fistula above the line of occlusion. The vesical end of the ureter being usually closed, simple hysterokleisis would rarely be permissible. Duclout[2] has placed on record one case in which it was both allowable and successful. Temporary closure of the fistula by cauterization of the cervical canal and by the introduction of laminaria into the cervix, neither of which produced symptoms of retention of urine, led him to suppose that there was communication between the ureter and the bladder; probably the vesical end had remained pervious. Simple hysterokleisis resulted in cure.

[1] *N. Y. Med. Journ.*, Dec., 1878.

[2] *Gaz. méd. de Paris*, 1869.

Hahn records a case in which spontaneous closure took place after another pregnancy. Previous to this he had made an artificial vesico-vaginal fistula, in the superior edge of which he had placed sutures that brought together the vesical and vaginal mucous membranes to prevent subsequent narrowing of the opening, and the inferior edge he sutured to the middle of the posterior vaginal wall. Eight months after he was obliged to reopen the canal by request of the husband, and the patient again became pregnant. After confinement, although the artificial fistula was unaltered, the uretero-uterine aperture could not be found.

Nephrectomy for Uretero-vaginal and Uretero-uterine Fistulæ.—This radical procedure was introduced by Simon, who in 1869[1] extirpated the kidney for a uretero-cervical fistula.

In 1879, Zweifel[2] reported a case of uretero-uterine fistula occurring after a fifth difficult labor from contracted pelvis. The diagnosis was established by catheterization of the ureter through the bladder. He had no difficulty in catheterizing the right ureter, which was done through the dilated urethra, but always failed with the left. Being unsuccessful with the various means of relief which were tried, he finally proposed either to perform kolpokleisis, with previous formation of a vesico-vaginal fistula, or extirpation of the left kidney. The latter operation was chosen. The case terminated favorably, and also without subsequent cardiac hypertrophy or any urinary disturbances.

In a few cases the high and inaccessible position of the fisula or failure to cure it by other operative measures has necessitated removal of the kidney for uretero-vaginal fistula.

Up to 1887[3] there have been 14 cases of nephrectomy for relief of ureteral fistula (these include all varieties). Of that number there were 11 recoveries and 3 deaths. Both the abdominal and the lumbar incisions have been employed, but the latter is far preferable, as it has been followed by a much smaller mortality.

A brief résumé of a single case of complicated vesico-vaginal fistula occurring in the author's private practice while he resided in Chicago is here appended, as serving to illustrate certain points in etiology and treatment heretofore described, but the details of the various operations will be omitted. It rarely occurs that one is able by a solitary case to demonstrate such a variety of procedures:

Mrs. B——, primipara, æt. 22, was delivered of a dead child by

[1] R. P. Harris: "One Hundred Cases of Nephrectomy," *Am. Journ. Med. Sci.*, July, 1882.

[2] *Arch. für Gyn.*, xv., or *Am. Journ. Med. Sci.*, Jan., 1880.

[3] S. W. Gross: "Nephrectomy" (on a collection of 233 cases), *Am. Journ. Med. Sci.*, July, 1886; Heilbrun: *Centralbl. für Gyn.*, No. 1, 1886; *Dict. des Prog. des Sci. méd.*, 1886.

means of forceps after many fruitless attempts. The forceps were permitted to remain in the vagina eleven hours, during which time occasional attempts were made to drag the dead fœtus through the swollen genitalia. When delivery was effected the perineum and a portion of the recto-vaginal septum were torn through, and in addition the neck of the uterus was extensively lacerated. Subsequently there was a slough of the anterior vaginal wall, resulting in a large vesico-vaginal fistula. She was confined to her bed for several weeks, during which time she had an attack of pelvic cellulitis and an abscess which discharged per vaginam for about two months. I saw her for the first time eight months after her accouchment. She was then in fair health, but a great sufferer in consequence of the immense vesico-vaginal fistula and absence of perineum and inferior portion of the recto-vaginal septum. After fully explaining to her and her husband and friends the length of time that might be requisite to effect a cure, all of the difficulties, sufferings, and possible risks associated with the ordinary surgical operations in similar cases, and also stating that most of these troubles could be avoided by closure of the vagina (kolpokleisis), she elected to have all needed operations for closure of the fistula and recto-vaginal septum. The appearance of the parts prior to her first surgical operation is represented by Fig. 135.

Fig. 135.

Altogether, she was subjected to five surgical operations, extending over the space of time from April 15, 1881, to January 31, 1884, in each of which procedures I had the assistance of Drs. H. P. Newman and H. J. and A. R. Reynolds of Chicago. The first operation performed was for restoring the urethral canal, a portion of which had sloughed away and the remainder of which was entirely impervious. The second operation, on July 11th of the same year, closed up a portion of the fistula on the left side; owing to loss of tissue and tension, it was an impossible task to close up any portion of the fistula situated on the right side of the median line. The surgical procedures for the fistula were performed with the patient in Simon's position and by the aid of Simon's specula. The appearance of the fistula on conclusion of adjustment of the sutures of this operation is shown by Fig. 136.

Two subsequent operations were required to entirely close up the

vesico-vaginal fistula. The first one of these two was not as successful as it should have been, on account of the state of the patient's health. In the last one of these, or the fourth upon the fistula, the tension upon the sutures, which extended from the denuded portion of the cervix uteri to the anterior margin of the fistula, was so great after adjustment was completed as to prevent union occurring. Accordingly, for the purpose of overcoming the tension, guy-stitches of strong silk were introduced through the posterior lip of the neck of the uterus, and also through a portion of the anterior vaginal wall near the ostium vaginæ

Fig. 136.

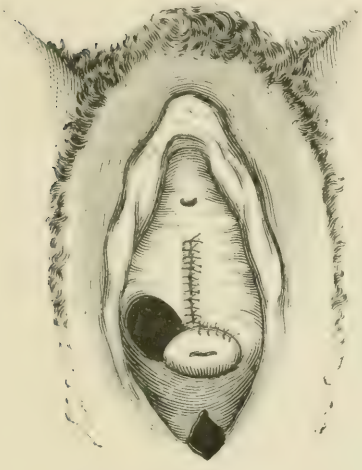
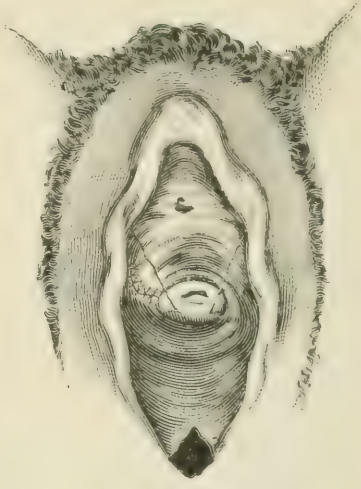


Fig. 137.



and on each side. Without this precaution the severe strain upon the silver-wire sutures would doubtless have caused them to cut through, and thus prevent union. The appearance of the fistula, neck of the uterus, and vagina after adjustment of the sutures and introduction of the guy-stitches is shown by Fig. 137.

The fifth and last operation was made January 31, 1884, on the perineum and recto-vaginal septum, and was successful.

Thus, after the lapse of over four years of indescribable discomfort and suffering on the part of the patient, during which time she had been nearly three years under treatment and had been subjected to repeated surgical operations, the damage done by a worse than bungling obstetrician was repaired. But the patient did not at first have perfect control of the bladder, either in voiding or retaining urine; yet the last report made to me a few months after the final operation was that there was gradual improvement in every respect.

Indirect Closure.—The various methods of cure for urinary fistulæ by obliteration of the genital canal below the fistula began with

Vidal's operation of episiostenosis. Simon and Jobert have improved upon the original procedure by closing less of the genital canal.

The six forms of indirect closure are based upon the site of operation. These are: simple episiostenosis; complete closure of the vulva with formation of recto-vaginal fistula (*obliteratio vulvæ rectalis*); transverse closure of the vagina (kolpokleisis) at the urethral portion, at the base of the bladder, and at the fornix; and partial oblique closure, which leaves one side of the vagina open in part or in its entire length.

The conditions—now but few—which are, in general, considered indications for episiostenosis or kolpokleisis are: loss of substance so great as to prevent any form of direct union, a comparatively rare occurrence; danger of wounding the peritoneum; great amount of cicatricial tissue in the margins, with portions of the latter adherent to the bone; severe hemorrhage. Inaccessibility of the fistula alone is no longer thought an insurmountable barrier to direct operation, but it may become an indication for kolpokleisis if accompanied by the three foregoing conditions. An inverted bladder filled with intestines may result from great destruction of substance and adds to the strength of that indication.

Episiostenosis.—After Vidal this method was practised by Wutzer, Bérard, Velpeau, and Dieffenbach, but without success. At some point along the line of union, usually just above the urethra, a small opening always remained. Shuppert was probably the first who obtained perfect closure.[1] The anterior portion of the vagina and the greater part of the urethra being gone, he considered cross-obliteration of the vagina impossible. With a trocar he opened the occluded portion of the urethra, in which a catheter was placed. He then denuded the inner surface of the labia majora, removed the nymphæ, and vivified a narrow strip around the introitus vaginæ. The freshened surfaces were united by silver sutures in a line corresponding to the antero-posterior direction of the vulva. The result was complete continence for two or three hours when the patient was recumbent, but she lost a few drops when walking about.

In cases where there is total loss of the vesico-vaginal septum accompanied by destruction of the entire urethra, or so great a part as to prevent obtaining continence even though the operation for episiostenosis is successful, the remnant of occluded urethra is left unopened, or if pervious is closed at the meatus. A recto-vaginal fistula is previously made to furnish an outlet for the urine, and episiostenosis performed. To form the recto-vaginal opening the posterior vaginal wall is depressed through the anus (Kaltenbach) and a transverse incision made; or, better still, the posterior wall is caused to protrude from the vagina by a finger introduced into the rectum and a piece of the septum excised.

[1] *Op. cit.*, p. 30.

The rectal and vaginal mucous surfaces are united by suture. This avoids leaving any raw surface to collect urinary deposits or to heal by granulation and contact. After the edges have healed, complete closure is performed, although Hegar and Kaltenbach consider it equally good practice to do both operations at one sitting. Before the final obliteration of the vagina is made, however, it is essential that just prior to securing the sutures the cavity to be enclosed be thoroughly cleansed and dusted with some antiseptic powder, such as iodoform, that the vesical side of the wound may remain as aseptic as possible for a few days at least.

Some have recommended that the recto-vaginal opening be made just above the rectal sphincter, but Antal has sought to improve upon this plan and prevent the urine constantly falling into the rectum by communicating with the latter at a higher point. Complete closure of the vulva with formation of a recto-vaginal fistula produces even less favorable results than simple episiostenosis. At best, with constipated bowels and continence of urine during a period of a quarter of an hour to two hours, the evils of feces and intestinal gases escaping into the bladder will sooner or later ensue. Decomposition of the urine takes place, which finally causes serious disorders of the urinary tract and rupture of the cicatrix. Should the latter accident occur, it may become necessary to close the recto-vaginal fistula and leave the vagina open.

Kolpokleisis.—When this operation is to be performed low in the vagina, the patient is best placed on the back or in Simon's position; but when the site of the operation is high, especially in the fornix, then she should be in the knee-elbow posture.

A strip of mucous membrane is dissected off extending around the vagina. The location of this ring of denuded surface should be far enough below the fistula to be in sound flesh and to avoid the scar-tissue of the margins; and, on the other hand, it should be as far above the outlet as these conditions will permit. Its position and direction are also governed by the varying laxness and tenseness of the vaginal walls at different points; those parts are selected for vivifying which most easily coapt.

A sound is placed in the bladder to serve as a guide while denuding the anterior half of the ring, and a finger introduced into the rectum serves the same purpose while the operator freshens the posterior half. The sutures are placed by passing the short slightly curved needle from without inward through the anterior margin, and from within outward through the posterior margin. Piercing the rectal or vesical lining is to be avoided if possible. Silver wire may now be drawn in if desired. The line of union extends from one lateral column of the vagina to the other, and particular care must be taken both in denuding and suturing

at these angles. After the sutures are fastened, water is injected into the bladder to see if there is any leakage.

The best results are obtained and the least dangers incurred in its performance when kolpokleisis is made at the base of the bladder. Perfect closure of the vagina at the urethral portion is attainable only with some difficulty on account of the thinness and frailty of the urethral wall, which cannot always offer sufficient resistance to the tension of the sutures. In kolpokleisis at the fornix there is danger of wounding the peritoneum in Douglas' pouch while denuding; or if there has been great sloughing of the cervix, especially the anterior lip, the peritoneum may even be injured in this region. When this accident occurs a sharp edge turns out, the upper edge of which has a smooth surface, and a few drops of serous fluid appear. This opening should be immediately closed with a stitch or two, after which the operator can proceed.

When the fistula is situated in one side of the vaginal vault and some portion of the lower margin is adherent to the bone or there is danger of wounding the peritoneum, Simon conceived the idea of closing the affected side and leaving the other half open in its entire length. If the fistula is located in the left side of the vault, the line of union extends diagonally from the right side of the cervix downward and toward the left to the middle of the vagina, or as low as is necessary. The uterus now communicates with the bladder and the menstrual flow escapes by the urethra.

After kolpokleisis menstruation usually appears again, even though it has been long in abeyance. Sterility naturally follows, although in a few cases conception has taken place, and even where the operation for closure of the genital canal had been so successful as not to permit any apparent incontinence of urine.

The reservoir formed by occlusion of the vagina is often difficult to empty completely; consequently, the urine stagnates, cystitis results, and this may, in turn, lead to disease of the ureter and suppurative pyelitis. The formation of stone is another sequence, although Simon has asserted that he observed this result only in those cases where perfect closure had not been obtained or where a thread had found its way into the bladder.

Kolpokleisis, even as a last resort, has not been regarded with marked favor by American surgeons, and some have gone so far as to declare that a patient's total discomfort will be less with a fistula than with kolpokleisis and its after-effects. Where there has been so great a loss of tissue as to allow the inverted bladder, into which the intestines have fallen, to prolapse through the vulva, surgical interference becomes a necessity either to relieve or prevent strangulation. But even under these circumstances Emmet makes closure of the vagina sufficient only to sustain the protruding bladder, and leaves an open-

ing above and below wide enough to prevent any accumulation of urine.

Wearing a urinal and giving careful attention to cleanliness remove some of the worst ills of those who are beyond the hope of cure.

Fecal Fistulæ.

Fecal fistulæ consist of abnormal communications between the vagina or labia and some part of the intestinal tract. They have received the following descriptive names: recto-vaginal, entero-vaginal, recto-labial.

Etiology.—The rectal varieties of fistula are less common than the urinary, though produced by similar agents. These may be briefly considered as of a pathological and a traumatic nature. When a malignant disease, such as cancer, has advanced sufficiently to involve the recto-vaginal septum in its destructive growth, no cure can be looked for. Phagedenic and syphilitic ulceration may also result in a permanent opening. The presence of syphilis with this lesion is, according to Emmet, an important factor in prognosis and treatment. The syphilitic discharge from the urethra or neck of the bladder, finding its way into the anus, excites an inflammation and ends in the formation of an abscess between the rectal and vaginal walls. This abscess opens into the vagina generally just behind the sphincter ani muscle, the opening into the rectum being usually oblique and complicated by stricture of the rectum to a greater or less degree. Stricture of the rectum, which causes a fecal accumulation and ulceration of the septum, may be an active agent; so also an abscess of the vaginal wall, of the labia, or of the glands of Bartholini, which discharges by a double perforation of the vagina or labia externally and the rectum internally, results in a fistulous opening. A like result may be attendant upon puerperal vaginitis accompanied with extensive sloughing of the vaginal wall and destruction of the septum.

Among the rarer forms of injury are those from instruments used in the removal of impacted feces, the administration of clysters, etc. In practice, however, we are chiefly concerned with fistulæ having their origin in childbirth. In instrumental delivery the instruments themselves may tear through the septum, or in laceration of the perineum extending through the sphincter the thicker portion only of the perineum may heal, leaving a fistulous opening above. Pressure in prolonged and difficult labor may excite inflammation and destructive sloughing of the recto-vaginal septum in the same manner as it does when vesico-vaginal fistulæ are formed. If the posterior wall of the upper part of the vagina is torn sufficiently, a knuckle of the small intestine may protrude through the opening, become strangulated, and slough off, giving rise to the artificial anus; or a coil of intestine lying

in Douglas' pouch may be severely compressed in labor, inflammation and adhesion to the posterior cul-de-sac occur, and perforation through the vaginal wall follow, establishing an entero-vaginal fistula.

Anatomical Characters.—As we have seen, the varieties of fecal fistula, excepting the recto-vaginal, are mostly the result of the burrowing of the purulent matter in finding its escape. The pus from an abscess about the vaginal wall or in the labia may escape by the labia and rectum and establish a recto-labial fistula, while at the brim of the pelvis or within the abdomen by its perforations it may produce a communication between some part of the large or small intestine and the vagina—namely, an entero-vaginal fistula. (For locations of fecal fistulæ see Fig. 84 of vesico-vaginal fistulæ.) The most frequent seat of fistulæ met with is that opening into the rectum just behind the sphincter ani muscle.

Their size may vary from those so small as to allow only the escape of intestinal gas to the entire destruction of the recto-vaginal septum. The recto-vaginal variety is generally much larger on the vaginal side than on the rectal, with the edges bevelled and more difficult of approximation. The communication may be direct, as in the recto-vaginal variety, or long and tortuous, as generally seen in recto-labial fistula.

Symptoms.—These vary somewhat with the size of the opening: if small, only the flatus escapes; if large, the fluid or semi-fluid contents of the bowel are thus discharged through the vagina. This involuntary escape of the offensive contents of the bowel renders the condition of the patient one of great annoyance and distress.

Diagnosis.—With the above characteristic symptoms the presence and seat of fistulæ should be determined by physical exploration. With the patient upon the back digital examination of the vaginal surface will detect a fistula of any size. If the opening is small, with the patient in the same position and the thighs flexed well upon the abdomen a Sims speculum should be placed under the arch of the pubes, the sides of the vagina separated with retractors, and the surface carefully inspected in a good light. Simon's fenestrated specula are also of great service, since the perineum can be retracted and the posterior wall exposed at the same time (Fig. 103.) Still failing, further aid may be obtained by filling the rectum with milk or a solution of indigo or cochineal, and carefully noting the point of escape within the vagina. If the fistula is one of the small intestine, it may be differentiated by the bright yellow semi-solid discharge of the digested food or chyle, and by the fact that the colored solutions injected within the rectum do not make their appearance in the vagina.

Prognosis.—These lesions, if not too large, may heal spontaneously, and are more liable to do so than the urinary fistulæ because of the less

irritating nature of the discharge. When, however, a natural cure does not follow, resort must be made to operative procedures. They prove no more intractable to operative measures than the vesico-vaginal, though the difficulty of operation is somewhat greater. If, however, the fistula is complicated with syphilis—and, according to Emmet, the presence of a stricture just within the anus is always a probable evidence, if not proof positive, of syphilis—the division of tissues which have undergone such changes only renders the condition of the patient infinitely worse.

TREATMENT.—The efforts of nature to repair these lesions of recent origin should be promoted by careful attention to local cleanliness, by the use of concentrated and nourishing food which leaves but little waste for removal by the bowels, and by securing rest of the part through the judicious administration of opium. When, however, the fistula has become chronic and has assumed a permanent character, resort must be had to operative measures for the cure of the affection. Before undergoing radical treatment the patient should be as carefully prepared as in the operation for urinary fistula, by a thorough course of constitutional treatment to ensure perfect health, by subduing local inflammation, and by the removal of any stricture of the rectum that may be present.

The only operation adapted to all forms of recto-vaginal and recto-labial fistulæ is the method by suture, though in the latter variety the ligature has been used with success.

By Suture.—The procedure will vary somewhat with the seat of the fistula. In recto-vaginal fistula with the opening in close proximity to the sphincter ani it is difficult to obtain union, owing to the contractions of the muscle. In such cases the perineum and sphincter should be divided up to the seat of the opening, the fistulous tract denuded, and the wound closed as in the operation for complete laceration of the perineum. When the septum is involved higher up in the rectum, the same method of paring the edges of the orifice and uniting them by the interrupted silver-wire sutures as that adopted in vesico-vaginal fistulæ is applicable, with the following exceptions: the patient is placed in the dorsal position and the lower limbs well flexed up on the abdomen; Sims' speculum is placed under the arch of the pubes to elevate the anterior wall of the vagina, while the sides are held apart by means of retractors, or Simon's fenestrated specula may be used. Previous to operating the sphincter should be paralyzed by thorough stretching.

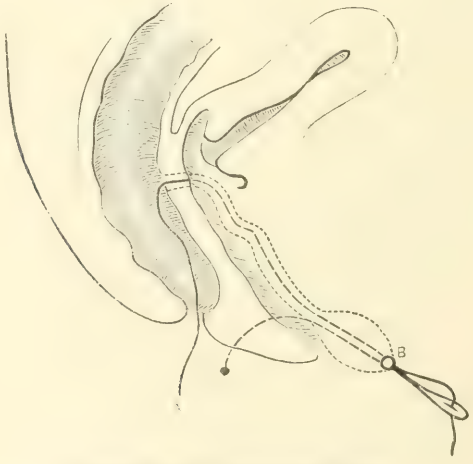
If the edges cannot be brought together without too great traction, they may be freed by division of the vaginal tissues. In some instances no amount of division allows of their easy approximation: then the edges must be split on each side to free the vaginal from the rectal

wall. The rectal orifice may then be closed by sutures, while the vaginal surface is allowed to heal by granulation.

Whenever the sides of the fistula can be brought together the opening should be closed through the vagina, for there is less danger of hemorrhage or cutting out of the sutures, the operation is easier of execution, and therefore more likely to be attended with success. If for any reason it becomes necessary to operate through the rectum, it should first be washed out with an enema, the patient placed upon the left side, and Sims' speculum held as in the vagina. A large dressing-sponge with string attached is carried well up to the sigmoid flexure, the edges of the orifice pared and united by silver sutures, leaving the ends bent down toward the anus, that there may be no obstacle to the withdrawal of the sponge or the passage of fecal matter. Concentrated diet should be given and the bowels kept confined by opiates.

By Ligature.—Recto-labial fistula may also be treated by the ligature, as first advocated by Professor J. R. Barton[1] of Philadelphia in 1839. Dr. Isaac E. Taylor[2] speaks of this method as the true and correct course of treatment, and has pursued it in more than forty cases. His method, which differs only in minor details from that of Barton, is as follows: "The usual surgical silver probe is introduced into the

FIG. 138.



Taylor's Case of Recto-labial Fistula.

labial orifice, pressed down to the lower part just outside the sphincter ani; the end is then cut open, then withdrawn, and a more slender and ductile one substituted and passed up to the rectal opening through the sinus, having the eye threaded with the ligature: the finger introduced

[1] *American Journal of Medical Sciences*, June, 1839.

[2] *Proceedings of the New York State Medical Association*, 1885.

in the rectum recognizes the probe; this is curved and gradually and gently drawn through the rectum and anus. The two ends are then tied, shotted, and clamped to make it more secure. When the external artificial opening is made it is apparent that we now have simply an ordinary fistula in ano, with an internal or rectal orifice high up in the gut."

The elastic ligature is superior to the silk or wire, does not require almost daily visits for the purpose of tightening or twisting the ligature to keep up the pressure, causes but very little pain in its application, in some cases does not interfere with the patient's business, and cuts itself out in from three to eight days according to the firmness and thickness of the structures to be divided. No after-treatment is needed except cool or warm applications as most agreeable, and an anodyne if needed.

The entero-vaginal variety of fistula, consisting of a communication between the vagina and some part of the intestinal tract above the rectum, may or may not serve as an artificial anus. If the continuity of the gut has been interrupted, as is done by implication of a long loop of intestine, the fistula becomes an artificial anus and the portion below it is in time narrowed, or even occluded. Closure would therefore be attended with serious danger or death unless a free passage could be opened between the upper part of the intestine and a still widely pervious portion of the bowel below the artificial anus. This has been successfully done by Heine. If the vaginal opening is small and connected by a fistulous tract with the bowel, closure of the lower opening would lead to the accumulation of fecal matter in the tract, and probably end in suppuration and abscess. Sometimes, however, small intestinal fistulæ, if cleanliness is observed, close spontaneously or heal after cauterization. As a last resort laparotomy may be performed, the divided ends of the intestine separated from their abnormal connections and resected, then direct enterorrhaphy made.

Recto-anal fistula (fistula in ano), although not strictly belonging to the domain of gynecology, is of so common occurrence among women as to warrant brief mention in an article upon the subject of fistulæ. From a practical standpoint we are chiefly concerned with the treatment of this lesion, the causes and symptoms not differing materially from those present in other fecal fistulæ.

In dealing with this affection there are three recognized surgical procedures for radical cure—namely, incision, ligature, and suture.

The old plan, and the one ordinarily pursued, consists in laying open the whole fistulous tract by incision of the tissues intervening between the fistula and the rectum and allowing the wound to heal by granulation. As a consequence, partial or complete incontinence was not uncommon, even in the hands of skilled surgeons, from division of the

sphincters. Allingham says: "In operating upon women suffering from fistulæ, cut as little as possible, for anything like too free incisions are apt to end in incontinence of feces, or, at all events, in such partial loss of power in the sphincter as to prevent the patient retaining flatus —a result which, I need scarcely say, is a most disagreeable one." The same writer also lays stress upon incising the sphincters at right angles to their muscular fibres. The author's observation convinces him that Allingham has not over-estimated its importance, and that even an oblique incision of the lower sphincter may result in complete incontinence.

The treatment by elastic ligature offers a valuable and generally certain cure for anal fistula, and is to be used where the knife is contra-indicated. The ligature may be applied, as in the method above given for the treatment of recto-labial fistula, by ligature when converted into the recto-anal variety.

The treatment by suture—that is, by complete excision of the fistula and perfect coaptation of the freshened surfaces by sutures—is the only procedure which secures immediate union by first intention. The long and tedious convalescence inseparably connected with the ordinary mode of operating by incision is avoided, and the incontinence at times resulting from division of the sphincter is prevented.

This method was first suggested to the author by his experience with various plastic operations upon the perineum. It has since appeared that the surgical principles there involved were applied to the treatment of fistula in ano by several surgeons working independently of each other, yet following essentially the same details, varied to suit the individul case.

The author's first case of fistula in ano treated in this manner was March 31, 1881, while he was a resident of Chicago, in which he was assisted by Dr. J. W. Mitchell of Knoxville, Iowa, but the technique of the operation was not described by him until 1883, in a paper[1] read by title at the meeting of the American Gynecological Society held in September of the same year. At the same meeting Dr. Emmet also referred to this mode of operating. About the same time Dr. Smith[2] applied this plan of treatment to an old standing fistula which had been treated unsuccessfully six months previously by the old method. The question of priority concerning this mode of operating, however, is not one of major importance.

The details of the operation, performed with antiseptic precautions, are as follows: The patient should be prepared for operation by thorough evacuation of the bowels. This is accomplished by a purge on the two

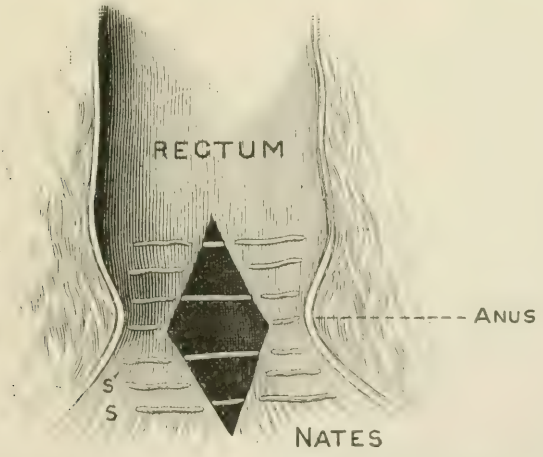
[1] "On a New Mode of Operating for Fistula in Ano," by Edward W. Jenks, M. D., *Am. Gynecological Society Trans.*, 1883.

[2] *Medical Record*, June, 1886.

days preceding, and an injection on the day of the operation. The parts about the fistula are washed and irrigated with the bichloride solution, and the rectum thoroughly cleansed of all fecal matter. A sponge wrung out of the bichloride solution, with a string attached, is carried up to the sigmoid flexure.

With the patient upon the back, or, if preferred, upon the side on which the fistula is located, the routes of the fistulous tracts are carefully determined and incised their entire length, aiming in every instance where the incision involves either sphincter to cut at right angles to the muscular fibres. If the sinus opens into an abscess-cavity, lay it open freely, that its surface may be readily reached. Completely excise the fistulous tract by dissecting out all the so-called pyogenic membrane or tissue along the routes by means of curved scissors or the knife. It is not unusual to find several bleeding vessels on excision, which should be secured by torsion in preference to ligatures, but if ligatures are necessary, the catgut, prepared with chromic acid, or Chinese silk may be used. Not infrequently after cutting a fistula there are found overlapping the incision portions of thin livid tissue of low vitality, which should be cut away in all instances, and the edges carefully pared that they may be brought together perfectly. Deep sutures may then be inserted beneath the fistulous tract to bring into apposition the freshened and healthy opposing surfaces and main-

FIG. 139.



Fistula prepared for Closure: S' and S, alternate deep and superficial sutures.

tain them there until union is effected. These sutures, best of catgut or silk, are inserted by means of curved needles and the speculum, or the rectum may be turned out, with the forefinger used as a hook, to obtain a better view. As the success of the operation largely depends

upon the complete union of the rectal surface, superficial sutures, in addition to the deep ones, are necessary to secure accurate adaptation of the edges of the mucous membrane.

A drainage-tube is inserted at the external or integumentary opening and the wound closed. Several deep sutures may now be made to include the entire field of operation, especially desirable where there are lateral sinuses to the fistulous tract, in order to relieve the adjusted surfaces of too great tension. During the operation the wound should be irrigated with the bichloride or other antiseptic solution. Finally, the sponge is withdrawn, the wound is dressed with iodoform, and iodoform or bichloride gauze applied externally. Opium is given to constipate the bowels for six to eight days, when the bowels are moved by means of laxatives, followed by enemata of oil to secure liquid stools. Concentrated nutritious diet is given, and the patient is kept in bed. The suture should be removed the same number of days after the operation as in similar plastic operations in other localities. When the fistula extends no higher than the sphincter, the divided sphincter and freshened surfaces may be united by silver sutures in the same manner as is done in complete laceration of the perineum.

When the fistula is connected with a large abscess-cavity as well, this may be cured at the same operation. The lining membrane of the cavity is carefully but thoroughly dissected out, and the healthy surfaces brought together and maintained in apposition by sutures passed as in treating the fistulous sinuses.

DISEASES OF THE BLADDER AND URETHRA.

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Boston.

I. ANATOMY;[1] METHODS OF EXAMINATION.

1. Anatomy of the Urethra.

The dimensions of the female urethra vary considerably at different ages and in different individuals. Its average length may be said to be 30 mm., although even under normal conditions it may reach 40 mm., and sometimes does not exceed 20 mm. In the later months of pregnancy the length is very much increased.

The meatus is the narrowest portion of the urethra, its diameter rarely exceeding 4–5 mm. From here the width rapidly increases for a distance of about 10 mm., then gradually diminishing to the orificium internum.

The wall of the urethra is a very tough, elastic structure, capable of great dilatation without rupture. Its inner coat or mucosa is thrown into several folds, of which the most prominent extends from the apex of the trigonum along the urethral floor to the meatus, where it is joined by two lateral folds to form a small prominence or tubercle called the veru montanum. These lateral folds begin at some distance from the meatus, run at first parallel with the median fold, or very slightly converging, until they reach a point 2.5 mm. behind the orifice, where they bend sharply inward to the veru montanum. Still another easily effaceable fold is found upon the superior wall along its whole extent.

The epithelial layer of the mucosa is composed of several rows of cylindrical cells, of which the most superficial become somewhat flattened as the meatus is approached, while at the vesical orifice they have a battledore shape and send out prolongations into the interstices of the underlying layers. Numerous small elevations or papillæ cover the whole surface of the mucosa.

The glands of the urethra are of three distinct varieties: First we find simple mucous follicles, which are distributed pretty evenly through-

[1] See also article on Anatomy, Vol. I.

out the whole mucosa. Then upon the anterior half of the urethral floor, upon each side of the central fold, are two rows of simple involutions of the mucous membrane, or crypts, also called the glands of Littré. Their course is backward, parallel with the urethral canal. They are usually twenty-five to thirty in number, and are large enough, some of them, to admit the end of a bristle. Sometimes there is an additional row on each side of the lateral folds. Their walls are also supplied with papillæ and mucous follicles.

Of far greater importance than the two preceding varieties are the two glands first described by Skene,[1] and since carefully studied by Kocks, Dohrn, Böhm, and especially by Max Schüller.[2] Their mouths are situated normally 2.5 mm. behind the meatus, at the angles made

Fig. 140.

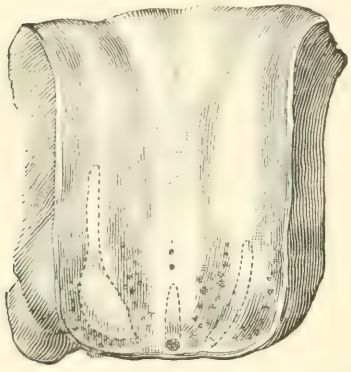


Fig. 141.

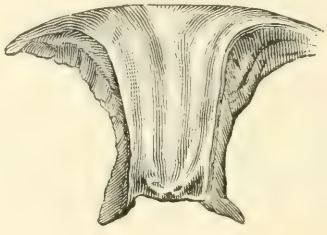


Fig. 140.—From a widow aged 40, dead from infarction of the kidneys and cystitis. Urethra laid open from above, and purposely strongly drawn apart. Very numerous large lacunæ and *three* urethral passages with round orifices surrounded by marginal swellings. The dotted lines show the extent and form of the passages. Bladder-like enlargement of the right urethral passage.

Fig. 141.—Urethra of a girl 9½ years old, dead from scarlet fever. Lacunæ not visible in the fresh preparation, but visible after immersion of the preparation in spirit. A broad oval with correspondingly formed marginal swellings (lips) surrounding the orifices of the two urethral passages.

by the two lateral folds as they bend inward toward the veru montanum. They run backward, parallel with the urethra in the cavernous portion of its wall, for a distance varying from 1 to 2.5 cm., and terminate in several small branches with blind extremities. They admit a No. 1 French probe, are sometimes dilated just behind the orifice, and are clothed with a mucosa similar to that of the urethra and richly provided with papillæ and muciparous glands. Appearing first in the sixth month of fœtal life, they attain their highest development during the period of sexual activity, after which they become partially atrophied, so that in old people they are often difficult to find.

[1] *Amer. Journ. Obst.*, 1880, xiii. p. 265.

[2] *Arch. für Path. Anat.*, 1883, xciv. p. 405.

The investigations of Dohrn and Schüller make it extremely doubtful whether these are the remains of the Wolffian bodies, as was supposed by Kocks, and their physiological significance is still unknown.

The submucosa is composed of a fine network of elastic fibres. Beneath this are two layers of smooth muscular fibres—the inner longitudinal, the outer circular. The latter, however, does not completely encircle the urethra except at its posterior half, and is there continuous with the circular fibres of the vesical sphincter. Between the circular and longitudinal layers lies the corpus cavernosum of the urethra, an erectile body made up of connective tissue, elastic fibres, and a large venous plexus. External to all these layers is a layer of striated muscular fasciculi which are partly longitudinal, partly circular: the latter surround the posterior half of the urethral canal and form a voluntary sphincter for the bladder.

The course of the urethra is nearly straight, its anterior end bending slightly upward and its posterior slightly downward, so as to give it a curve which is a trifle sigmoid. In the erect posture its course is nearly vertical.

The urethra is strongly attached to the pubic arch by the median pubo-vesical ligament, which also serves to hold it in position. The interval between the urethra and pubes varies from 10 to 19 mm. Its distance at the meatus from the pubic rami varies in adults from 1.6 to 2.6 cm. when the soft parts have been removed. Below, the urethra is in intimate relation with the vagina near the meatus, the interval between the two increasing up to the orificium internum, where it amounts to about 1 cm. This interval is filled with loose cellular tissue.

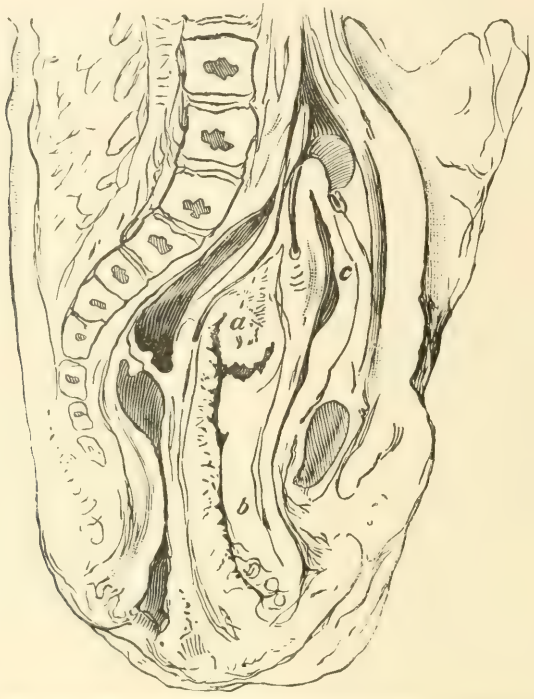
2. Anatomy of the Bladder.

The capacity of the female bladder is probably somewhat greater than that of the male. Its shape, too, differs somewhat from that of the latter, being broader, while its antero-posterior diameter is less, owing to the interposition of the uterus between it and the rectum. Sections of the empty bladder, made antero-posteriorly, have disclosed two very different shapes. The usual form which the bladder takes when empty is that of the letter Y:[1] the upper free portion of the bladder, which extends from the neighborhood of the os internum uteri behind to the top of the pubes in front, simply collapses when the organ is fully emptied, so that the summit of the bladder comes to lie upon the vesical orifice (Fig. 141). Thus are formed the two arms of the Y—a posterior, extending backward from the ostium to a point opposite the os internum of the uterus; and anterior, extending upward

[1] Hart: *Edinb. Med. Journ.* for 1879, xxv. p. 892; and 1880, xxiv. p. 794.

and forward to the top of the symphysis. In other cases, however, the bladder has been found to retain, when empty, the oval form, its cavity then forming a slightly curved canal continuous with that of the urethra. In these cases the walls are thick and apparently in a con-

FIG. 142.



Vertical Mesial Section of Fœtal Female Pelvis (spirit-hardened). Empty bladder (*c*) is above pubis; *b*, vagina; *a*, uterus cut to one side (Hart).

tracted condition, which has given rise to the suggestion that the bladder may have been in a condition of systole at the moment of death, the Y-form representing the state of diastole. The oval is the shape always found in young infants, since the bladder does not become a pelvic organ until later in life.

The structure of the bladder is so well known that it demands but little attention here. It has a thin mucosa, loosely connected with the subjacent tissues and sparsely provided with mucous follicles and simple crypts, both of which are somewhat more numerous at the fundus: in this region there are also a few papillæ and occasionally lymph-follicles. The mucous membrane is continuous with that of the urethra and ureters. The latter open into the bladder at the base of the trigone by two narrow valve-like orifices, situated one on each side of the median line about 2.5 cm. from the urethral opening and the same distance

from each other. The internal orifice of the urethra also forms, when closed, a transversely curved slit, the concavity of which faces upward. The muscular coat of the bladder consists of three layers—an inner and outer of longitudinal, and a middle of circular, fibres. At the vesical neck there is such an arrangement of circular fasciculi as to form a well-marked sphincter, which is continuous with that of the urethra. That portion also of each ureter which traverses the vesical wall is so invested with muscular fasciculi that with increasing distension of the bladder there is a corresponding increase in the elasticity of these fibres, which aids the valvular arrangement of the mucous membrane at the orifice of the ureter in preventing a back flow of urine. The vesical opening of each ureter is marked by a slight prominence or ridge, and these two prominences are united by a transverse band called the interureteric ligament.

The serous coat of the empty bladder is reflected from that covering the anterior abdominal wall at about the upper margin of the pubes. It then passes over the summit and sides of the bladder to a point about opposite the internal os of the uterus, from which it passes up into the fundus of this organ. Its attachments in front to the abdominal wall are not at all close, so that when the bladder is distended the peritoneum is pushed up from the pubic region, and a very considerable extent of the bladder comes to be in apposition with the abdominal wall without an intervening fold of peritoneum.

The relations of the female bladder are of great interest because of their bearing upon the etiology of vesical disease. The base of the bladder is loosely connected by cellular tissue to the anterior vaginal wall from the internal orifice of the urethra to the bottom of the anterior vaginal cul-de-sac, a distance of about 4.5 cm. It is then loosely attached to the cervix as far as the internal os, beyond which point it is separated from the uterus by the vesico-uterine peritoneal fold. The ureters enter the vesical wall 1.25–1.50 cm. in front of the cervix uteri, and 4–5 cm. apart; they then run inward and slightly forward, to open into the bladder 2.5–3 cm. from each other and about the same distance from the vesical orifice.

The anterior wall of the bladder is not, as is sometimes stated, closely united to the pubes; on the contrary, this interval is filled with a large amount of fat and loose cellular tissue, which permits the bladder when distended to rise up out of the pelvis into the abdominal cavity.[1]

Laterally, the bladder is in relation with the broad ligaments, and above with the small intestine, rectum, and vermiform appendix. The vesical neck is surrounded by a large serous plexus communicating with that of the uterus and urethra. On account of these important relations the bladder is liable to participation in a great variety of pelvic

[1] Hart: *loc. cit.*

and abdominal affections, to which reference will be constantly made in the following pages.

A word may here be added in regard to one or two points of vesical physiology. It is pretty definitely ascertained that the normal mucous membrane of the bladder is not capable of absorption: with the diseased bladder the case is quite different, since absorption may take place here, as elsewhere, from an eroded or ulcerated surface.[1] The function of the vesical sphincter is still a matter of dispute. It would seem, however, from the experiments of Kaprersow that the sphincter vesicæ plays something more than a merely passive rôle as the bladder becomes distended. This author found that section of the lumbar cord below the sixth vertebra was followed by incontinence of urine, while section above the fourth caused retention. It is probable, therefore, following Kaprersow, Powers, and other authors, that there is a reflex centre in the lumbar cord which receives sensory impulses from the vesical wall, and sends back motor impulses to the vesical sphincter to induce more powerful contractions of the latter as the bladder fills. This centre may at any moment be inhibited by an impulse of cerebral origin, and the bladder be emptied at will. The opposing theory of Rosenthal and Wittich is that closure is effected simply by the elasticity of the fibres at the vesical orifice: this is, however, gradually overcome by the collecting urine, until at last a drop or two escapes into the urethra, the desire to micturate is felt for the first time, and the bladder emptied by an action of the will. The vesicular sphincter is supposed by them to merely exercise the function of expelling completely the last few drops of urine from the bladder, while the power of retaining the urine for any length of time resides in the sphincter urethræ.

The theory of a reflex centre for the vesical sphincter seems to offer a more plausible explanation of certain functional affections of the bladder and the rapidity with which they sometimes yield to stimulating treatment: as instance of this may be cited the immediate effect which electricity occasionally has upon certain forms of diuresis—a fact which it would seem more difficult to reconcile with the supposition of a simply mechanical closure of the vesical orifice. Still, these are questions for physiologists to decide, and must for the present be left undetermined.

3. General Methods of Examination and Diagnosis.

The mutual relation existing between most vesical or urethral disorders and affections of the other pelvic viscera makes it imperative, in all cases of symptoms referred to the bladder, to examine not only the bladder itself, but also the adjacent organs. Most important perhaps

[1] Alling: *De l'Absorption de la Muqueuse vesico-urethrale*, Paris, 1871.

will be the vaginal touch, which may give valuable information as to the thickness of the urethro- and vesico-vaginal septa, the presence of tumors or foreign bodies in these organs, or of excessive tenderness, losses of continuity, or of urethral and vesical displacements. By the aid of bimanual palpation the uterus and its surroundings are to be carefully explored in search of malpositions, inflammatory deposits, new growths, hypertrophy, and the like. Rectal examination, especially in children, is often to be employed. Abdominal palpation may disclose unusual resistance above the pubes, or a pyriform tumor such as is formed by a distended bladder, or in rare cases a nodular condition of the vesical walls, or other abdominal tumors which exert pressure upon the bladder. Percussion of the abdomen should never be neglected in our search for the same possible etiological factors. Visual inspection of the vulva and anus for the presence of hemorrhoids, fissures, or plaques muqueuses is to be regarded as a matter of course. A sound is next to be passed into the bladder, and any local or general tenderness of the urethra, any obstruction to the passage of the instrument, or any deviation from the normally straight course of the canal is to be carefully noted. Once within the bladder, the beak of the sound should be turned carefully in all directions in search of a possible stone or other foreign body, or if there is any strong reason for suspecting something of this nature which the ordinary sound fails to detect, resort may be had to the sound devised by Napier, the polished end of which is first dipped in a solution of silver, so that it may accurately register any contact with a rough, hard body. While sounding, too, the depth of the vesical cavity is to be noted, which is stated by Duncan to be about 15 cm. from the meatus to the extreme summit of the healthy bladder. The sound will also reveal any excessive tenderness of the vesical mucous membrane or any marked roughness of the vesical wall, such as is caused by trabecular hypertrophy, polypoid growths, cancerous nodules, or phosphatic deposits. Examination of the urine should never be neglected, not only because of the evidence it affords as to the condition of the bladder itself, but because it is important to determine whether there is any renal complication or any excess of urates, phosphates, or other irritating ingredient: urine which has been drawn by catheter is best for this purpose, since that passed by the patient is always liable to contamination with vaginal secretion. The next step in this routine examination should be the use of the endoscope, which deserves a somewhat more detailed description than the other more common methods of diagnosis already named.

Endoscopy.—Ocular inspection of the urethral and vesical interiors is obviously highly desirable in diseases of these organs; and yet, in spite of the ease with which this can be accomplished by means of the endoscope, this instrument is still regarded by most practitioners as a refine-

ment worthy only of the specialist. Desormeaux was the first to devise an instrument of this sort, but they have so multiplied in the last decade that there is now plenty of room for individual choice. The only endoscope which brings the whole vesical interior into view is that of Rütenberg: for a description of this elaborate contrivance the reader is referred to the article by Winckel in *Billroth's Handbuch d. Frauenkrankheiten*. By means of this instrument the bladder is kept distended with air while the speculum is in place: Winckel has used it in many cases, and considers it a great accession to our means of diagnosis. The simpler specula, however, answer to the needs of most physicians, and for inspection of the anterior two-thirds of the urethra a couple of hair-pins may be bent at right angles and employed as retractors, the parts being illumined by the ordinary head-mirror and either sunlight or a lamp placed a little to one side of the patient. The various ear-specula may also be used for the same purpose; Reeves has made a very useful endoscope by simply removing a small oval piece from the side of an ordinary silver ear-speculum. Reeves Jackson prefers an instrument exactly like an anal speculum, except that it is much smaller. The self-retaining nasal speculum of Jarvis will also at times prove very serviceable.

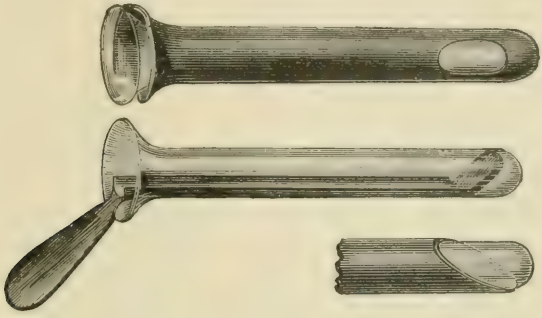
Of the endoscopes proper, by means of which the deeper portions of the urethra and the anterior of the bladder may be brought into view, the two best are those of Grünfeld and Skene. The patient is put in the dorsal position for examination, and the parts are illumined by means of a head-mirror and lamp as when the various other specula are used. Each of these instruments consists of a short straight tube closed at its inner, and flaring at its outer, end. That of Grünfeld[1] is of metal, blackened on the inside and closed at the inner end by a plain glass disk set obliquely, in order that the rays of light may penetrate it instead of being partially reflected back. Skene's instrument (Fig. 143) has three parts: the endoscope proper, which is merely a diminutive glass test-tube; a speculum of hard rubber, into which the test-tube fits, and provided with a fenester through which applications may be made to the urethral wall after the endoscope is withdrawn; and a small mirror like a laryngoscope, which is set at an angle of a hundred degrees upon a stem of thin silver plate transversely curved so as to fit the wall of the tube and occupy the least possible space.

The urethra should not be previously dilated for endoscopic examination of the urethra itself or of the vesical neck, since dilatation so alters the blood-supply of the parts as to make the picture obtained no longer reliable. It is possible that cocaine will often be of great service in rendering the examination painless, but the tendency of this drug to produce local anæmia, as is observed to follow its use in the nasal

[1] *Wiener Algem. Zeitung*, 1874, p. 98.

passages, must be borne in mind. A small quantity of a 4 per cent. solution may be injected into the urethra by means of an ordinary dropper one or two minutes before the examination. Urethroscopy is by no means to be regarded as a *dernier ressort* to which refuge is to be had only in difficult and obscure cases. It is an extremely simple procedure, and has unquestionably, in experienced hands, given results

FIG. 143.



Skene's Endoscope.

which make its universal acceptance as a part of routine examination very desirable. As an instance of its usefulness may be cited the actual inspection by Skene of vesico-urethral fissure, a lesion which had hitherto been merely presumed, never seen; also the condition of hyperæmia of the vesical neck as seen and described by the author in a number of cases which would otherwise have been treated as neuroses.

The endoscope, however, does not disclose every pathological condition: it is notably deficient in differentiating certain new growths and granulations of the deeper portions of the urethra; and this deficiency has led Emmet to prefer an operative procedure for purposes of urethral inspection—*i. e.* division of the urethro-vaginal septum from a point a short distance behind the meatus nearly to the sphincter vesicæ.[1] Emmet has devised for this operation a pair of buttonhole scissors, one blade of which is passed into the urethral canal: the incision can, however, easily be made with the knife upon a No. 12 block-tin sound, which is first carried into the bladder. Great care must be taken not to carry the incision too near to the vesical sphincter, in order that the latter may escape all injury. If it is desired to keep the wound open, the urethral and vaginal mucous membranes should be united by a continuous catgut suture along the whole circumference of the incision, and any urinary deposit prevented by daily vaginal douches of hot water. If immediate closure be desired, interrupted wire sutures are to be passed as in ordinary vesico-vaginal fistulæ, except that the edges of the urethral

[1] *Principles and Practice of Gynæcology.*

mucosa are to be included in the sutures in order to secure perfect apposition. In either case the patient is to be kept in bed for ten days after the operation, and allowed to empty the bladder herself as often as she desires. Emmet considers this manœuvre absolutely safe and requiring no unusual dexterity on the part of the operator. In certain cases where the urethra is thickened or dilated near the vesical orifice, or when great vesical irritability or perhaps intractable cystitis leads to strong suspicion of an urethral polyp which the endoscope fails to discover, the buttonhole operation just described offers a justifiable and efficient means of urethral exploration.

There remain two exceedingly valuable methods of vesical exploration, which are, nevertheless, because of their operative nature, to be reserved for serious and obscure cases: these are dilatation of the urethra and vaginal cystotomy.

Artificial Dilatation of the Urethra.—As a means of diagnosis dilatation has been in use for only the past fifteen years. The dilatability of the canal has, however, long been known, and also employed for operative purposes: even Celsius advised the removal of calculi through the urethra, and this procedure was revived by Marianus Sanctus and Franco in the early part of the sixteenth century. It made, however, but little progress until the first half of the present century, when Anthony Cooper performed gradual dilatation by means of compressed sponge in five cases for the removal of vesical calculi. Huguier adopted the same method in 1860, but it was not until ten years later that the process of rapid dilatation began to be employed. At about this time the idea seems to have originated independently with several surgeons, notably Simonin of Nancy, Paul Hyford, Christopher Heath, Robiquet, and Simon of Heidelberg. Simonin did dilatation in five cases, enlarging the urethra to a diameter of 2.5 cm. and more without resulting incontinence. Hyford in a careful monograph published in 1872 advised rapid dilatation up to a diameter of 1.3 cm. for the removal of calculi, deeming it unsafe to exceed this limit; he was probably the first to perform this operation. Heath dilated with the finger, and still prefers the same method. Robiquet[1] used the dilator of Dolbeau, and did not consider a diameter of 3 cm. beyond the limits of safety.

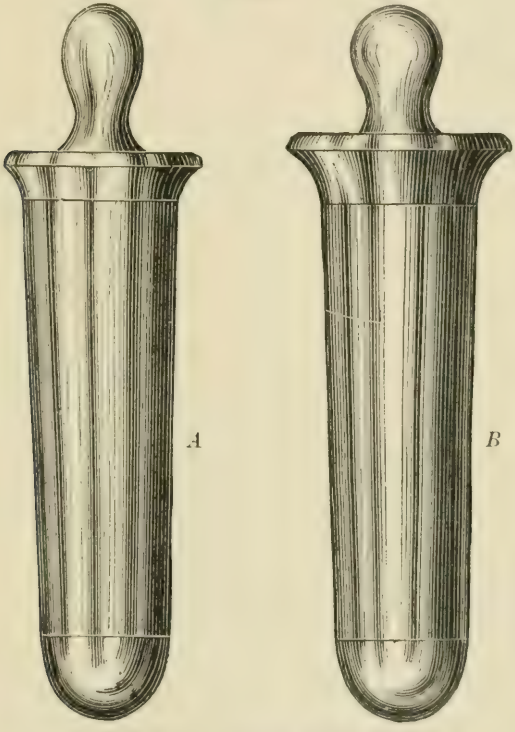
It is, however, to Simon[2] that we are chiefly indebted for this procedure as it is now employed. He was the first to make it available to the profession, to indicate precisely the limits to which the dilatation could be safely carried, and the conditions which demanded its use. His method still remains the one most universally employed, easiest of application, most satisfactory in its results, and most devoid of danger.

[1] *Union médicale*, 3me Série, 24, 890.

[2] H. Wildt: *Arch. f. klin. Chirurg.*, 1875, S. 167.

It is carried out as follows: Since the meatus is the narrowest part of the urethra, three small incisions are first made in its border, two above and somewhat laterally to a depth of 2.5 mm., and one below to a depth of 5 mm. The author, however, has usually dispensed with the latter, because of the troublesome hemorrhage which sometimes results. These incisions prevent subsequent laceration and allow the finger to be passed deeper into the bladder. Dilatation is then effected by means of a set of seven slightly tapering hard-rubber plugs (Fig. 144),

FIG. 144.



Simon's Urethral Dilators.

the smallest of which has a diameter of 7 mm., the largest of 20 mm. at its base. Each of these plugs consists of an outer cylinder and an obturator, the latter being merely to give a rounded end to the cylinder for purposes of insertion, and easily withdrawn without the cylinder if it be desired to leave the latter in place as a speculum. These plugs are passed rapidly, one after the other, into the urethra, each being allowed to remain a few seconds, until the desired degree of dilatation is reached. Up to the age of fifteen years the limit of dilatation should be from 1.5 to 1.8 cm., according to the age, while at twenty years and above it may be safely carried to a diameter of 2 cm. This

readily admits an average index finger, which has a diameter of about 1.8 cm. at its base. After withdrawing the last plug the index finger of the left hand, or in young girls the little finger, is carried through the urethra into the bladder; and if the index finger is used, much may be gained by introducing the middle finger into the vagina to assist in palpation of the vesico-vaginal septum: the right hand should be used for conjoint manipulation, as in examinations of the uterus. Slight hemorrhages sometimes occur from ruptures of the urethral membrane, and severe ones are not unknown, although of very rare occurrence when the meatus is first incised and the prescribed limits are not exceeded: they are to be stilled by topical hæmostatic applications, or, if severe, by tamponing the vagina so as to compress the urethra, or possibly, if at the meatus, by a deep suture. Incontinence of urine followed in some of Simon's cases for a few hours after the operation, and is the consequence most generally feared. It is indeed not to be wondered at that permanent incontinence has sometimes resulted from artificial dilatation, when we consider the various methods which have been and are still practised, most of which are inexact and calculated to produce laceration and overstretching of the sphincter. Fingers, too, vary much in size, and if the index finger were to be taken indiscriminately as the limit of dilatation, no doubt some operators would have an undue proportion of unfortunate results. Incontinence is of very rare occurrence when the precautions recommended by Simon are faithfully observed and the index finger does not exceed the average size. Simon in 1875 had dilated over sixty urethræ without seeing a case of permanent incontinence result. Noeggerath[1] in a series of over seventy cases experienced it but twice. By means of digital palpation the whole vesical interior, except that portion of the anterior vesical wall directly behind the pubes, can be thoroughly explored. The indications for urethral dilatation will be specified in treating of the various urethral and vesical diseases.

Vaginal Cystotomy.—This operation renders every portion of the vesical interior accessible to the index finger: its disadvantages are, on the other hand, sufficiently obvious. To make the incision the patient should be etherized and placed on the side in the usual Sims position. A curved sound is then passed into the bladder, its beak pressed against the vesico-vaginal septum in the median line a short distance behind the vesical orifice, and held by an assistant in this position. The mucous membrane covering the beak is then steadied with a tenaculum, and with the knife or scissors the septum is cut through upon the sound, especial care being taken to divide the vesical and vaginal membranes at corresponding points. The incision should be longitudinal, and for purposes of diagnosis need not exceed 2 cm. in length. In rare instances this

[1] *Am. Journ. Obst.*, May, 1875.

may, if necessary, be subsequently enlarged, so as to extend nearly to the cervix uteri, and a transverse cut 3–4 cm. long may also be made at its cervical extremity. Through the T-shaped opening thus made the whole vesical coat may be gradually drawn down by tenacula and inverted through the vagina, so as to be open to direct inspection and operation. Cystotomy as a means of diagnosis would hardly be indicated except in cases of suspected vesical tumor or encysted calculus, where the opening would also serve for purposes of operation.

Sounding the Ureters.—A diagnostic method may perhaps be spoken of here which was first introduced by G. Simon, but which has of late been raised by Pawlik[1] to a considerable degree of importance. Simon found that it was possible in the female to pass a sound or catheter into the pelvis of either kidney by using the index finger in the bladder as a guide to the mouths of the ureters, of which, however, only the slight elevation upon which they are situated can be felt. A more detailed description of this somewhat difficult method of Simon may be found in Winckel.[2] Pawlik has more recently accomplished the same feat in more than 150 cases by a simpler method which does not require previous dilatation of the urethra. Upon the vaginal surface of the vesico-vaginal septum the boundaries of the trigonum are marked by furrows, two of which diverge from the vesical orifice toward the mouths of the ureters, where they are crossed by two other small furrows. With the patient in the knee-elbow position and the perineum well retracted, an especially-adapted catheter is passed through the urethra and along the line indicated by one or the other furrow until it engages in the mouth of the ureter. This does not always succeed at the first attempt, but rarely fails of ultimate success if the parts are in normal position. Owing to the somewhat circuitous course of the ureters any deep sounding can hardly be devoid of danger unless experience has already been gained by considerable practice upon the cadaver. By either of these methods urine may be collected from either kidney, and thus in cases where one kidney is diseased and its removal proposed the integrity of the other may be ascertained. Pawlik considers the method of especial value for exactly localizing the ureters in laparotomy and extirpation of the uterus. In one case also the procedure gave immediate relief from an attack of renal colic.

II. MALFORMATIONS OF THE URETHRA, BLADDER, AND URETERS.

1. Embryology.

At a very early period of fœtal life, toward the end of the first month, before the closure of the abdominal wall, and at a time when

[1] *Arch. f. Gynecol.*, No. 49. [2] In *Billroth's Handbuch d. Frauenkrankheiten.*

the intestinal canal is in its most primitive condition, a small hollow sprout or process is formed upon the ventral aspect of the caudal extremity of this canal, which is called the allantois. This process rapidly increases in length, and as the abdominal walls close in around the umbilical opening, the allantois, which is now a long hollow tube emptying into the lower end of the intestinal canal, also becomes included in the umbilical cord, and is thus divided into an external and an internal portion. The latter gradually dilates to form the urinary bladder, and probably also participates in the formation of the urethra.

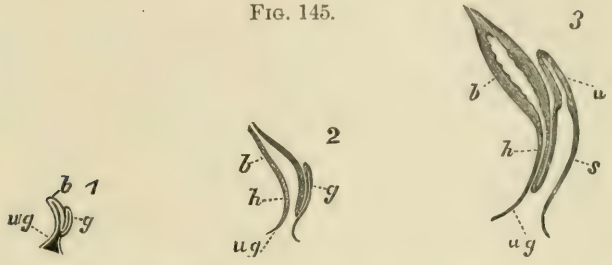
Meanwhile, the secretory part of the urinary apparatus has been undergoing an important succession of changes. During the first few weeks the function of the future kidney has been temporarily performed by the Wolffian bodies or primordial kidneys, two glandular structures situated on each side of the vertebral column and having excretory ducts, the Wolffian canals, which open into the lower portion of the allantois near its junction with the intestine. From each of these Wolffian canals a sprout is then formed which rapidly develops into permanent kidney and ureter, the latter emptying at first into the Wolffian canal, but subsequently separating from it entirely and entering the allantois by an opening situated slightly above that of the Wolffian canal. When this stage has been reached the Wolffian bodies and canals have no further significance in the female economy, and are to be found in the fully-developed fœtus only as the so-called organ of Rosenmüller—a remnant of an embryonic structure.

Besides the Wolffian canals and the ureters, the lower portion of the allantois receives also two other ducts, situated still nearer the intestine than the Wolffian canals, and called the ducts of Müller. These are formed independently of the Wolffian bodies or canals, and their lower portions are destined by their subsequent confluence to become the uterus and vagina.

It is thus seen that early in fœtal life the primitive urogenital systems and digestive tract all empty into a common cavity, the cloaca. This cavity has at first only one external opening, but about the middle of the third month a division takes place, both in the cavity and outlet, by means of which the future rectum and anus become separated from the common receptacle of the urogenital systems, and the latter with its outlet is now called the urogenital sinus. This sinus has an extremely important bearing upon the origin of urethral malformations, as has also the relative rapidity of development of the genital and urinary systems as compared with each other. In a fœtus of three months this sinus has a depth of about 2.5 mm., and the ducts of Müller are about equal in size to the now spindle-shaped dilatation of the allantois which forms the bladder (Fig. 145, 1). A month later (Fig. 145, 2) the sinus urogenitalis has still the same depth, while the uterus and bladder have

both increased in size, the latter, however, much more rapidly than the former, so that the sinus urogenitalis seems now to be the prolongation of the bladder, while the utero-vaginal canal appears rather as an appendix. It is only at the fifth or sixth month that this relation is materially changed (Fig. 145, 3), the utero-vaginal canal having now taken on a rapid development and appearing henceforth as the real prolongation

FIG. 145.



Sinus Urogenitalis and its Appendages, from Human Embryos (in life-size): 1, from a three months' fœtus; 2, from a four months'; 3, from a six months': *b*, bladder; *h*, urethra; *ug*, sinus urogenitalis; *g*, genital canal, common rudiment of vagina and uterus; *s*, vagina; *u*, uterus (Kölliker).

of the urogenital sinus, the depth of which has also somewhat increased. We shall hereafter see that these facts will explain some of those malformations which have given rise to the greatest confusion in diagnosis.

The process by which the female urethra is developed seems to be still unknown. That it begins at a relatively late period would seem to be the natural deduction from the fact that in most cases of persistence of the urogenital sinus, even after the latter has become the prolongation of the vagina, all trace of the urethra and vesical sphincter is wanting. Rose[1] believes that the urethra is developed by the union of three separate parts—*i. e.* an inner or vesical portion; an external portion, or pitting-in of the vestibular mucosa; and a middle portion, which develops as a process from the anterior intestinal wall. To say nothing of the difficulty of conceiving such a development, except at a very early period, when, as a matter of fact, all trace of the urethra is still wanting, we should expect to meet with traces of this vestibular portion in those cases where the development of the middle and vesical portions has been arrested; *i. e.* in cases of persistence of the urogenital sinus—a variety of malformation which has as yet failed to appear.

2. MALFORMATIONS OF THE URETHRA.

(*a*) *Irregularities of position and direction* are rarely found apart from other abnormities of the neighboring organs; and this is also true in

[1] *Monats. für Geburtskunde*, Bd. xxvi. S. 244.

general of all the other urethral malformations which will hereafter be described.

In cases of atresia or imperfect development of the vagina the situation of the urethral meatus is often extremely low, so that a catheter has to be directed at first upward toward the symphysis before it can be carried directly backward into the bladder. Again, the meatus may be situated unusually high, whereby the natural curve of the urethra is greatly exaggerated: in such a case the stream of urine may be directed upward instead of downward, and considerable precaution is necessary in catheterization. Malgaigne tells of being called upon to catheterize a woman who had had retention for three days succeeding childbirth, and of the great difficulty he experienced in introducing a catheter until he was informed by the patient that neither she nor a daughter of hers had ever been able to urinate in the ordinary position, since the direction of the stream was almost directly upward.

Instead of being in its normal position, the meatus may be situated above the clitoris—a malformation which Gosselin claims to have been frequently able to demonstrate to his pupils. This anomaly is attended with no inconvenience on the part of the patient, although it might give rise to considerable confusion in attempts at catheterization. It has no further embryological significance than simply as indicating an unusually low formation of the genital tubercle from which the clitoris is afterward developed—a process which is quite independent of the development of the internal genito-urinary system.

(*b*) A *double urethra* has been observed in only two cases. In one of these[1] the urethra began at the vesical orifice as a single canal, and then divided, 0.3 cm. from its origin, into two channels, which pursued a nearly parallel course and opened about 0.3 cm. apart in about the usual situation of the meatus. In the second case there were also two openings in the vestibulum, one of which led directly into the bladder through an urethra of ordinary length, while the other ended in a blind pouch; it should be stated, however, in regard to this second case, that the pouch seems quite likely to have been an artificial production, since the patient, who was an adult, had been subjected immediately after birth to an operation for retention of urine. The explanation of these cases of duplexity seems exceedingly difficult, now that the theory of Remak in regard to the double origin of the allantois has proved to be incorrect.[2]

(*c*) *Hypospadias* in the female is a term under which several widely-different conditions have been described. Most German authorities extend its application to those not exceedingly rare cases where there

[1] Fürst: *Arch. f. Gynäkol.*, 1876, Bd. x. S. 161.

[2] Vide Kolliker: *Entwickelungs Gesch. d. Mensch. u. Thiersch. Organismus;* also His: *Anatomie Menschlicher Embryonen.*

is a total absence of the urethra—cases which we shall soon consider as persistence of the urogenital sinus. Strictly speaking, hypospadias is simply a defect of the inferior wall of the urethral canal, and much confusion will be avoided if the use of the term is restricted to this variety of malformation. Several cases of this nature have been described, and they all present the common feature of a more or less symmetrical trough or groove which occupies the usual position of the urethral canal. This defect does not necessarily involve the urethra throughout its whole extent: it may be limited to the anterior portion, while the posterior half of the canal retains its normal perfection of form and function. Usually, however, the sphincter vesicæ is also imperfectly or not at all developed, and there is incontinence of urine. This is always the case when the defect involves the whole length of the canal, the vesical orifice being then represented simply by a rounded or oval opening, usually transverse, through which one or two fingers can easily be introduced into the bladder. The clitoris may also be cleft, and the furrow may then be prolonged from the meatus upward over the vestibulum to the anterior margin of the symphysis. In a case reported by Heppner[1] the posterior half of the urethra was well developed, while the anterior portion was represented only by an irregular furrow running between several small mucous prominences which seemed to be remnants of a former urethra: the etiology of this case is, however, doubtful, since the patient had been subjected in early childhood to an operation for vesical calculus. In our present state of ignorance in regard to the development of the urethra it is impossible to say whether these cases of hypospadias are to be interpreted as the result of an arrest of development or as a vice of development. Nunez[2] accepts the latter explanation, according to which the urethra is to be regarded as having been at first fully developed, with subsequent reabsorption of its inferior wall.

(*d*) The only known case of *epispadias* in the female, apart from extrophy of the bladder, has been recently observed and described by Guyon.[3] This writer defines the condition as "a total or partial defect of the anterior urethral wall, with ectopia of the urethral canal." Guyon's case presented in the vestibular region a small red tumor which could be pushed back through an opening into the bladder, and which was evidently the prolapsed vesical mucosa. This opening was shaped like a horseshoe, the convexity being directed upward and the base resting upon the anterior vaginal wall, from which it was separated by a thin mucous membrane. This latter was evidently the floor of the urethra, and extended backward a distance of 1.5 cm. before joining the

[1] *Monats. f. Geburtsk.*, 1865.

[2] "Vices de Conformation de l'Uréthre chez la Femme," *Thèse.*

[3] Nunez: *op. cit.*

vesical mucosa. It is hardly necessary to say that there was absolute incontinence of urine. The case differs from one of subpubic vesical fissure in the presence of this urethral floor.

(*e*) *Congenital atresia urethræ* may have a widely varying influence upon the life of the individual according as the urine, at the time when the stricture forms, is able to find another mode of exit from the bladder. If no such opening of derivation is formed, the urinary passages above the seat of obstruction become gradually distended as a result of the constant secretion of urine which undoubtedly takes place during the later months of fœtal life, and the fœtus is rendered unviable, or the distension may even be so great as to form a mechanical obstruction to delivery. If, however, the urine finds exit through another channel—and this channel, leaving out of consideration the origin of vesical extrophy, is usually a pervious urachus—the life of the individual may be indefinitely prolonged. The urethral obstruction is usually in the form of a membranous wall, which may cross the canal in a transverse, more often decidedly oblique, direction, and may be readily perforated with a bistoury. More rarely, a small portion of the urethra is transformed into a solid cylinder. The obstruction may be situated anywhere from the meatus to the vesical orifice. A case was observed by Bar[1] where a newly-born child presented such a projection at the vulva, as a result of the distension by urine of a membranous wall covering the urethral meatus, that the child was supposed at first to be a male. At the umbilicus the constant escape of urine and the resulting irritation produces a condition of things which might at first give rise to difficulty in diagnosis. The mucous membrane at the mouth of the fistula becomes in time greatly hypertrophied in the form of bright-red warty growths which present much the appearance of a cock's comb; or, as in the case of Petit, there may be a veritable tumor which has to be raised before the fistulous opening is disclosed.

A slighter degree of congenital stricture seems to be occasionally met with in young girls in the form of a narrowing of the meatus. These children are said to suffer from irritable bladder, and relief is usually afforded by a moderate dilatation of the constricted portion.

(*f*) *Persistence of the Urogenital Sinus.*—In using this expression as describing a variety of malformation it is not to be understood that the embryonic canal called the urogenital sinus normally disappears. On the contrary, as we have already seen, this canal seems to increase in length with the further development of the genital and urinary systems,[2] so that in the sixth month of fœtal life we find it considerably larger than at the fourth month. Hence it may be said that the urogenital canal always persists as a permanent structure, but from the fact that in the event of a full normal development of all the

[1] Nunez: *op. cit.*

[2] See Fig. 145, from Kölliker.

pelvic organs this sinus becomes the lower part of the vagina, while in cases of imperfect genito-urinary development it usually retains its fœtal character, it seems proper to speak of persistence of the urogenital canal as a malformation.

The development of the genital and that of the urinary system seem to go hand in hand, so that when an arrest of development occurs in either, the other rarely reaches its normal perfection. This fact led Heppner to enunciate the law that absence of the urethra is always accompanied by rudimentary organs of generation. We have already seen that during the first few months of fœtal life the bladder develops much more rapidly than the uterus and vagina, and that until about the fifth month the urogenital sinus—or, as it may also be called, the urogenital canal—appears to be a direct prolongation of the bladder. Later, this relation is changed: the uterus and vagina take on a rapid development; the urethra begins also to form; and the urogenital canal appears henceforth as a prolongation of the vagina, finally as a part of the vagina itself.

These facts are of great importance in interpreting the widely-varying conditions which may result from an arrest of development at different periods of intra-uterine life. To begin at a very early period, the development of the pelvic organs may go no farther than the formation of the cloaca, with or without an external opening. Such a condition has been observed in the newly-born, but has but very little present interest, since such a fœtus is not viable. If further development is arrested at any time during the first four or five months of fœtal life, after the formation of the rectal cloison, but one opening will appear between the clitoris and anus, and this will lead directly into the bladder. The uterus and vagina will be found to be more or less rudimentary, and the vagina may be represented merely by a blind pouch extending partway from the uterus toward the vesical opening, or it may open into the latter by an orifice which will vary in size according to the earlier or later period at which further development ceased. In other words, the condition represents a urogenital canal which seems to be the direct continuation of the bladder; the organs of generation are still rudimentary, and there is no indication as yet of the urethra or sphincter vesicæ. Such a case has been recently reported by Post[1] in addition to the few other examples of this rare anomaly which have been recorded. Here there was regular menstruation through an opening which could not be discovered; and indeed the woman had borne one child, showing that the uterus and ovaries were at least tolerably well developed. The external urogenital orifice was provided with a sphincter muscle—a modification probably of the musculus bulbo-cavernosus—and coitus was effected through this sphincter. The woman

[1] *Am. Journal of Obst.*, 1885, vol. xviii. p. 785.

suffered from incontinence when standing. A remarkable case of similar character is also reported by Dyrenfurth[1] of an individual who lived for sixty-eight years as a male, and in whom a post-mortem examination discovered ovaries and a rudimentary uterus. This woman did not menstruate, and had a penis-like clitoris 8 cm. in length, but without any trace of a penile urethra. At the base of the clitoris was an opening through which a sound could be passed into the bladder, and at the autopsy an incision made through the base of the bladder into the rudimentary vagina showed that a sound passed through the incision would also emerge at the external opening—an instance, therefore, of persistence of the urogenital canal, into which a rudimentary vagina opened by a small orifice. Such a case would usually be mistaken for hypospadias in the male, and the only possible means of diagnosis during life would be the detection of the vaginal opening into the urogenital canal, together with the absence of a testicular body in either of the labia majora or the inguinal rings. Incontinence is not usually present in these forms of early arrest of development, unless the external sphincter with which the urogenital canal is commonly provided has been dilated by repeated coitus.

A somewhat more common variety of this malformation is that which is usually described as total absence of the urethra or as a form of hypospadias. The vagina and uterus are tolerably well developed, and the hymen is not wanting, as in the cases hitherto described. There is, however, a total absence of the urethra—neither a fossa at the usual situation of the meatus, nor the slightest indication of a groove, such as is found in true cases of hypospadias. About 3–4 cm. up upon the anterior vaginal wall is a simple rounded opening, without a vestige of cicatricial tissue and without a sphincter, through which one or two fingers can be passed without difficulty into the bladder. These patients usually give a history of incontinence dating from early childhood.

It seems most natural to interpret these malformations as a partial arrest of development dating from a period when the urogenital canal has already taken on the character of a vaginal outlet, but the urethra is still unformed.

Between those forms which date from an early period of fœtal life and those last described it is possible to conceive of many varieties, although examples of such are to be found only here and there recorded. In two instances the urogenital canal divided a short distance from its mouth into two canals, a posterior vaginal and an anterior or partially developed urethra, of which, however, the sphincter was sufficiently well developed to prevent incontinence. In both of these cases the urogenital canal was scarcely larger than a quill. Again, in place of the vagina a blind pouch may be found, 3–7 cm. in depth, with a short

[1] *Centralb. f. Gynäkol.*, 1884, Bd. viii. S. 385.

imperfectly-developed urethra opening into its anterior wall, or with merely a fistula-like opening at the usual situation of the vesical orifice.

The DIAGNOSIS of urethral malformations will usually demand a careful exploration of the various canals by means of sound and finger, and when possible by the aid of a speculum. It is perhaps the determination of sex in children which will present the greatest difficulty; and such a determination is not always possible even after the patient has reached an age when we are assisted by external habitus, sexual inclination, and the like. To distinguish between a hypospadiac male and persistence of the urogenital canal in the female we shall be aided by palpation of the labia majora in search of testicles, and by palpation of the uterine region through the rectum, or, possibly, through the urogenital canal. Our chief effort, however, must be to determine whether this canal is single—*i. e.* the prostatic portion of the male urethra—or whether it presents in some part of its course a second opening through which a probe can be passed into a rudimentary vagina. When such a division of the urogenital canal exists, it is said to afford infallible proof that the individual belongs to the female sex, although it is to be borne in mind that one or both ureters might possibly open in this situation. The presence of a testicular body in one or both labia is only of relative value as an aid in diagnosis, since an ovary may thus descend through an inguinal hernia. Persistence of the urogenital canal is also to be distinguished from atresia vaginæ with subsequent dilatation of the urethra as a result of coitus; in the former the sphincteric orifice presents an appearance quite different from that of a patulous urethra, and the perineum has a median raphé, without trace of a vaginal orifice or of cicatricial tissue.

Persistence of the urogenital canal has also been simulated in one instance by a growing together of the lower portion of the labia majora, so as to cover the vaginal orifice and form but a single opening between clitoris and anus, through which a sound passed directly into the bladder: to recognize such a condition it is only necessary to remember that it may occur.

Urethra duplex could only be confounded with an abnormal situation of a ureter, such as will be hereafter described, and here the constant dripping of urine from the supposed urethra would disclose the error.

TREATMENT.—Cases of congenital atresia urethræ with an umbilical fistula have been completely cured by operative perforation of the urethra and ligature of the umbilical excrescence. In two cases of complete obliteration of the canal[1] the bladder was perforated in the sub-

[1] One of Cabral, 1594 (*vide* Nunez: *op. cit.*); the other reported by Middleton, *Am. Journ. Med. Sci.*, 1868, Jan., p. 69.

pubic region by means of a bistoury, and this artificial passage kept open by the temporary insertion of a catheter: no alarming hemorrhage appears to have resulted from the operation, and the result was permanently successful in each case.

Hypospadias may also be treated by operative interference, with a prospect of at least greatly improving the patient's condition. Leberdeff[1] in a woman of twenty-three suffering from absolute incontinence, where the trough was deep and the walls high and prominent, simply freshened the edges of the latter and united them by ten silver sutures over a catheter *in situ*: the first operation was successful, and the patient could retain her urine for an hour in a sitting posture. Mörike[2] operated somewhat differently, the conditions also being somewhat different. Here the groove was very shallow, with scarcely appreciable walls; incontinence was present since birth, and no trace of a vesical sphincter. Mörike freshened the margins of the groove, and then made two lateral incisions through the vesico-vaginal septum, extending upward and outward from each angle of the congenital fistula, so as to form a vesical flap, which was then drawn down over the groove and united to its freshened margins. This operation resulted, after a second trial, in a good urethra and perfect continence, in spite of the absence of any regular vesical sphincter. This is to be regarded as an exceptionally fortunate result, but in any case it may be hoped at least to so lengthen the urethra that a receptaculum can be more easily fitted and worn.

In those similar cases of persistence of the urogenital canal where the vagina is tolerably well developed and all trace of urethra is wanting an attempt may also be made to build an artificial urethra by removing a strip of mucous membrane from each side of the usual course of the urethra along the anterior vaginal wall, and uniting these freshened surfaces by silver sutures over a catheter. The operation has, however, been performed so rarely that it is still to be regarded as a curiosity in surgery, and any further details may here be omitted. (For a full account of the difficulties attending such a procedure the reader is referred to the chapter in Emmet's *Gynecology* on urethral fistula, where a similar operation upon a case of hypospadias is fully described.) If it does not seem advisable to attempt such an operation, it is best in such cases to rely simply upon artificial appliances for collecting the urine, such as are used in ordinary cases of vesico-vaginal fistula. No advantage is to be gained by any attempt to diminish the size of the fistula; on the contrary, a transverse slit has proved to be better adapted for purposes of retention than a small round opening. Heppner[3] enabled his patient to retain her urine indefinitely by the use of a

[1] *Arch. f. Gynäkol.*, 1880, Bd. xvi. S. 290.

[2] *Berliner klin. Woch.*, 1880, Bd. xvii. S. 334.

[3] *Loc. cit.*

vaginal pad, held in position like a Cutter pessary, and fitted so as to compress the posterior lip of the fistula against the symphysis.

3. Malformations of the Bladder.

The section of vesical pathology may be passed over all the more lightly because, in addition to the great variety of vesical malformations in the female, the only one of these which is of any clinical importance —viz. vesical fissure—belongs rather in the domain of the general surgeon than in that of the gynecologist.

(*a*) The bladder may be entirely absent, although such cases are of the greatest rarity, and the only one to be met with in recent literature is that of Oliver.[1] Here the urethra ended about 4 cm. from the meatus as a blind pouch capable of holding about 5 cc. of urine; both ureters were inserted into this pouch, the right being impervious, while the left was greatly dilated and capable of serving as a partial reservoir. There seems to have been no further trace of the bladder, and hence the probable supposition that the case was really one of congenital origin rather than of vesical atrophy as a result of disuse.

(*b*) Cases of *double bladder* appear to be diminishing in frequency with the advance of pathological anatomy; and this fact necessarily throws considerable doubt upon the value of many cases which have been reported here and there by early writers. Molinetti, for instance, speaks of a woman with five bladders, each with separate ureter, and all opening into a single common urethra—a case more probably of sacculated bladder. (*Vide* Vesical Hypertrophy.) Blasius also describes a case of total division of the bladder into two halves, as found at the autopsy of an adult male. Other examples of this anomaly are said to have been frequently observed in the newly-born, as in the case of Schatz,[2] where in addition to a double bladder there were also double uterus and vagina, with a congenital vesico-vaginal fistula between each half of the bladder and its corresponding vagina. Cases of a more incomplete division of the bladder do not appear to be quite so rare. This division is usually antero-posterior, either as a slight furrow extending over the summit of the organ, or in the form of a septum which may in turn either be partial or complete, so that there is absolutely no communication between the two lateral compartments. An apparent transverse division of the bladder into two parts may be simulated by a dilatation of the urachus so as to form a large cyst which is connected by a small opening with the vesical cavity. In all cases of apparent duplicity of the bladder the possibility of enormous pathological cysts and sacculæ must be borne in mind, and even the post-mortem diagnosis of vesica bilocularis must be made with care.

[1] *Lancet*, 1879, vol. ii. p. 829.

[2] *Arch. für Gynäkol.*, 1872, iii. S. 304.

(*c*) *Vesical fissure, or partial defect of the anterior vesical and abdominal walls*, is by far the most common vesical malformation, although the proportion of females thus affected is much smaller than that of males. Among the numerous theories which have been advanced in explanation of this anomaly, the one which still has the greatest number of supporters is that originally put forth by Duncan, according to which the neck of the allantois is supposed to have become impervious at an early period of intra-uterine life, before the closure of the abdominal walls; hence retention of urine, rupture of the allantois, and adherence of its edges to those of the abdominal fissure. Rose, on the contrary, supposes every case of vesical fissure to have been originally a pervious urachus—a theory, however, which is hardly reconcilable with the occasional normal situation of the umbilicus some distance above the fissure. Klebs regards the relative frequency of other fissures in combination with that of the bladder, such as hare-lip, epispadias, spina bifida, etc., as proof that some more general factor is needed in the explanation of this anomaly, possibly an affection of the amnion.

The extent of the fissure may vary from a very small opening, not larger than the finger, to an almost total defect of the whole anterior uracho-vesical wall from the umbilicus to the neck of the uterus. These extreme cases of vesical fissure are generally termed extrophy of the bladder, since the whole remaining portion of the viscus is usually inverted or prolapsed through the vesico-abdominal opening. A small fissure may be situated entirely below the symphysis, involving only the vestibular region, or it may lie just above the pubes, or still higher, in the region of the umbilicus. The fissure usually appears as a small circular opening, the edges of which are occasionally cicatricial, and through which a bright-red mucous surface, the posterior vesical wall, is visible, or possibly prolapsed in the form of a small sensitive tumor. The external skin is directly continuous at the margin of the opening with the vesical mucosa.

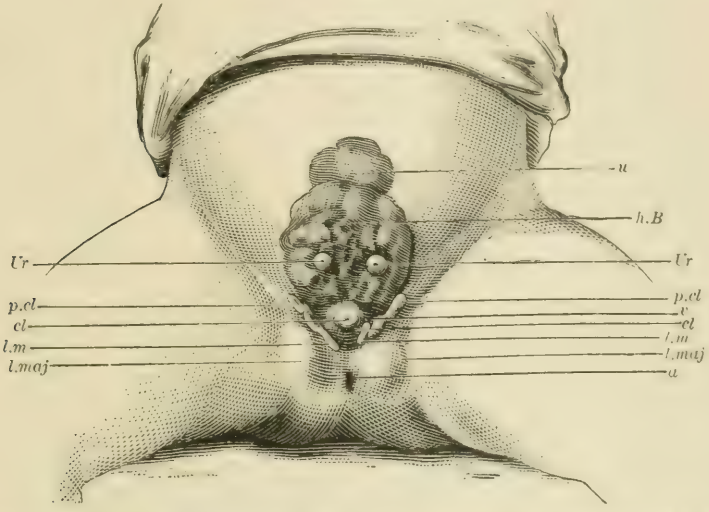
The form of vesical fissure should not be confounded with simple fissure of the abdominal wall, through which the anterior surface of the normal bladder may partially protrude.

When there is total defect of the anterior vesical wall the relation of the parts is often somewhat confusing, and the accompanying illustration, taken from the report of a case observed by Merman,[1] will serve as a type of the appearance usually presented by such a malformation. Above is a large tumor which represents the everted bladder (*h.B*) with its two ureters (*Ur*, *Ur*), and below is the anal opening (*a*), between which and the umbilicus the distance, as in all these cases, is much less than normal. Just above the anus is a second opening (*e*), supposed by Merman, on account of a small circular fold at its orifice resembling a

[1] *Arch. f. Gynäkol.*, 1885, xxvi. S. 143.

hymen, to be the vagina, but possibly the cervix uteri, since in many of these cases the vagina is also to a great extent involved in the fissure, and by lifting the vesical tumor the neck of the uterus is often brought directly into view. On each side of the vaginal opening are the labia majora (*l.maj*) converging below, but widely separated above, where the

FIG. 146.



Ectopia of the Bladder and Epispadias in the Female: *u*, umbilicus; *Ur*, urethra; *h.B*, posterior wall of bladder; *cl*, clitoris; *l.m*, labia minora; *v*, vagina; *a*, anus; *l.maj*, labia majora; *p.cl*, prepuce of clitoris.

remains of the cleft clitoris are also visible. Here there is only a slight separation of the pubic bones, although this is usually much more extensive in cases of such extreme extrophy.

When the vesical extrophy is of long standing the vesical mucosa on the edges of the tumor is usually found to have become somewhat altered and thickened, so as to have more or less the character of epidermis, and nearly the whole vesical mucosa may in time undergo the same change. The ureters are not always visible, as in the above illustration, but are often concealed beneath the edges of the overlying tumor: they are often considerably dilated just behind their vesical orifices, and may be the seat of numerous calculi. The urethra is usually entirely lacking, or at least the urethral canal may be said to be always impervious. In rare instances there is a double uterus or vagina; the former has also been found rudimentary, although it is, as a rule, fully developed. There is always a greater or less degree of pubic diastasis, varying from 1 to 8 cm., the pubic bones being connected only by fibrous bands, so that the gait of the patient is often rendered extremely uncertain and tottering.

The SYMPTOMS of vesical fissure are not such as to necessarily endanger life, and such an individual may in rare instances reach a considerable age. If the fissure is small, the chief discomfort will be from the constant escape of urine and the resulting excoriation of the surrounding parts; these may also become thickly incrusted with urinary salts, and are always the seat of a constant burning and itching, which render the life of the patient miserable. In rare cases, however, a partial retention of urine is effected, either by a sphincteric action of the orifices of the dilated ureters or by a temporary plugging of the fissure by a partial protrusion of the posterior vesical wall. When the defect is more extensive, so as to permit of more or less complete vesical extrophy, the extreme sensitiveness of the vesical tumor becomes a still greater source of annoyance to the patient than the incontinence. In spite of the change in character which the exposed mucosa gradually undergoes, so as to resemble more and more the epidermis, it seems to remain extremely sensitive to the slightest contact of clothing or instruments. The tumor can always be easily replaced, but any apparatus for the purpose of keeping it reduced will soon become unendurable and have to be speedily abandoned. In some cases the mucous surface of the tumor undergoes a sort of polypoid hypertrophy, so as to present an uneven, nodulated surface, which bleeds easily and has much the appearance of a malignant new growth. Even extreme vesical extrophy does not prevent conception and subsequent childbirth.

4. MALFORMATIONS OF THE URETERS.

It is not the purpose of the author to give here a detailed description of all the possible anomalies which the ureters may present, since the great majority of these are without the least clinical interest, and are discoverable only upon abdominal section. Such is the presence of a double ureter on one or both sides, a malformation so common that at least fifty examples of it are to be found in *Virchow's Archiv* for the past thirty-five years. Double ureters almost invariably proceed from a kidney which has two distinct pelves, and as a rule they unite into a single canal before reaching the bladder. In exceptional cases, however, the duplicity persists throughout their whole course, and two openings into the bladder are found a few millimeters apart in about the usual situation of the normal orifice, or one division of the double ureter may terminate below as a cul-de-sac, as in a case observed by Beach,[1] where such a pouch was found post-mortem filled with pus. Again, both kidney and ureter of one side may be entirely absent: an instance of this anomaly was recently reported by Cutler before the Boston Society for Medical Improvement, where the left kidney and

[1] *Brit. Med. Journ.*, 1874, i. p. 649.

ureter were absent, and the bladder presented no indication of an opening where the left ureter should have terminated; there was also no left renal artery. Rayer[1] remarks that the total absence of both kidneys has been observed several times in the fœtus, and occasionally in the infant at birth: he mentions the case also of a girl of fourteen who had neither kidneys, ureters, nor bladder, but with an umbilical fistula from which a fluid resembling urine escaped: we are not informed, however, as to the termination of this fistulous tract, and the above case is hardly to be accepted as fully authentic. Congenital atresia of one or both ureters seems also extremely exceptional, although a case supposed to be of this nature is reported by Davis Colley:[2] A child of eighteen months presented at the meatus urinarius an apparent prolapse of the urethral mucosa; this was excised, and a subsequent autopsy showed that the tumor had been in reality a vesical prolapse, caused probably by atresia of the mouth of one of the ureters, and resulting in the protrusion of this region by the pressure of urine from above.

For the gynecologist, however, there is a variety of malformation of the ureters which, although extremely rare, may claim a position of considerable importance—where, namely, one or both ureters, instead of emptying into the bladder, open externally or into one of the other excretory canals. We have already seen that when the bladder is congenitally absent the ureters may open into the cul-de-sac which forms the inner termination of the urethra. Cases are said to have occurred also where, the bladder being absent, both ureters have been found opening into the rectum or vagina.[3] Phillips[4] mentions a case of congenital absence of the bladder in which the ureters opened through the abdominal parietes as two small pouches on each side of the suprapubic region. But even when the bladder and urethra are both normally developed, one or the other ureter may have an abnormal insertion which is productive of the same direful consequences which always attend absolute incontinence of urine, and which has been proved by the author to be susceptible to an operation that will afford complete relief. Only four cases of such a malformation appear to have been observed—one by Emmet, where a ureter opened into the vagina on a level with the cervix uteri,[5] and three where the mouth of the left ureter was found in the vestibulum near the meatus urinarius. Of these three, one was observed by Von Massari,[6] the ureter opening by a very minute orifice in a fold of the preputium clitoris. Of the other two, one was seen and operated upon by the author;[7] the other was found by him in

[1] *Diseases of Kidneys*, 1841.
[2] *Lancet*, 1879, i. p. 372.
[3] *Todd's Cyclopædia of Anatomy.*
[4] Oliver: *Lancet*, 1879, ii. p. 829.
[5] *Principles and Practice of Gynecology*, 1880.
[6] *Berliner klin. Woch.*, 1879, xxix. S. 880.
[7] *Vide* author's pamphlet: *Malpositions of the Ureters*, Boston, 1876.

the records of the Boston City Hospital. These two cases were remarkably similar in every respect. Both were young women suffering from incontinence, in whom urine was found to escape drop by drop from a small orifice in the immediate neighborhood of the meatus urinarius. This external orifice was very minute, and in the author's case escaped for a long time the most careful observation: behind the orifice, however, the canal appeared to be of quite considerable calibre, and when a probe was introduced the ureter could be easily traced along the anterior vaginal wall to the left lateral cul-de-sac, passing directly over the site usually occupied by the vesical orifice of the left ureter, and separated from the vagina by only a thin septum. In neither case was any connection observable between the left ureter and bladder, either by the aid of a vesical sound or by the intravesical injection of milk. In the author's case the quantity of urine which escaped from the external orifice was much less than that passed *per urethram*—a fact strongly suggesting the possibility of a double left ureter, of which the other division opened as usual into the bladder; or there may have been a considerable difference in the size of the two kidneys. There was an extreme irritability of the bladder, so that the desire to micturate was felt every few moments, although the patient could retain her urine for about an hour.

Treatment.—Only two cases are on record where any operation for the relief of such a malformation has been attempted—*i. e.* the author's case and that of Emmet. The latter proposed to build an artificial channel from the abnormal vaginal orifice of the ureter to the point where it should normally have entered the bladder, and then, after perforating the bladder at this point and allowing the margins of the perforation to heal, to close in the whole by a vaginal flap, so as to shut off the uretero-vesical channel from the vagina. The first part of the operation was successfully performed in the same manner as an artificial urethra would be constructed: the completion was, however, unfortunately prevented by the death of the patient from an intercurrent pneumonia.

The operation conceived and successfully terminated by the author for the relief of his patient was as follows: The abnormal opening was at first supposed to be a fistula leading from the left ureter, since previous to etherization a probe could be passed only to a depth of $2\frac{1}{2}$ inches, and it was proposed simply to close the supposed fistula. It was found, however, after etherization, possibly as a result of muscular relaxation, that the probe penetrated easily to a depth of 7 inches, and in cutting down upon the probe at a point $1\frac{1}{2}$ inches from the meatus the canal was found to be lined with mucous membrane; hence the diagnosis of a malformation of the ureter. The latter was now dissected up from the incision to a point in the vesico-vaginal septum

corresponding to the normal situation of the vesical orifice of the left ureter; here also an opening was made into the bladder through which the ureter was turned in after its redundant portion had been excised, and its extremity was united by cotton sutures (the only ones at hand) to the edges of the vesical mucosa at the inner border of the perforation. The vaginal edges of the incision were then drawn together around the ureter by silver sutures. For eight days the bladder and vagina were washed out two or three times daily, and the urine was drawn every four to six hours. The sutures were then removed, the line of union found to be perfect, and the patient allowed to pass her urine naturally. The cotton sutures came away through the urethra. There was, of course, no further incontinence: the patient could retain her urine for four to five hours, and, with the exception of the subsequent formation of a vesical calculus, which was easily removed through a vesico-vaginal incision, the result of the operation was in every way perfect.

III. AFFECTIONS OF THE FEMALE URETHRA.

§ 1. ABNORMALITIES OF FORM AND POSITION.

1. Dilatation.

The urethra may be enlarged throughout its whole extent or the dilatation may be limited to certain portions of its canal.

(*a*) *A uniform dilatation* of any such degree as to give rise to complaint or call attention to the condition is rarely met with. In women who have borne many children, and in the period immediately following childbirth, there is often a lax condition of the urethral walls as a part of the general lack of tonicity of the whole parturient canal; but most of the cases where a uniform dilatation of any considerable degree has been found have occurred in women with congenital atresia of the vagina; and in many of these cases coitus has been habitually effected by means of the urethra. The latter, when dilated, has in several instances been mistaken for the vagina, not only by the patient herself, but also by the attending physician: a case is reported by Daviat[1] in which a midwife at the onset of labor-pains manually dilated the urethra to a circumference of 12 cm. under the impression that it was a narrow vagina; in another case a dilated urethra was made by a physician the receptacle for a uterine pessary. Other causes of this form of dilatation are the insertion of wax candles or other foreign bodies into the urethra for purposes of masturbation; the passage of large calculi or portions of tumors by means of involuntary expulsive efforts of the bladder; eversion of a part or a whole of the mucous membrane of the bladder

[1] *Bull. de la Soc. de Chirurg.*, 1872, p. 560.

or urethra; and, possibly, now and then, artificial dilatation of the urethral canal.

The SYMPTOMS of uniform dilatation are usually insignificant when uncomplicated by other vesical or urethral lesions. Incontinence is the exception, not the rule, in cases resulting from congenital atresia of the vagina, and the patient is often able to perform her marital duties without inconvenience. In other cases the mucous membrane may be found excoriated and inflamed or more or less prolapsed—conditions to which it is certainly predisposed by the dilatation: the patient may then suffer from a certain amount of vesical irritation or there may be a painful tumor at the meatus—symptoms, however, which belong more properly to the complication than to the dilatation itself. In cases due to calculi, tumors, or vesical prolapse there is often incontinence of urine.

The recognition of this lesion will scarcely be attended with any difficulty when the dilatation is of sufficient extent to cause incontinence or prolapse. The prognosis must naturally be extremely guarded when there is established incontinence, while the other symptoms, such as prolapse or vesical irritation, can usually be completely relieved. When the condition has given rise to no symptoms whatever, it manifestly requires no treatment. When there is incontinence or prolapse, the attempt may first be made to bring about retraction of the relaxed urethral walls by the use of astringents. We may make occasional topical applications of strong tinct. iodini along the whole course of the urethra, and at the same time a gelatin bougie containing a few grains of alum or tannin may be daily inserted; or if these efforts do not succeed recourse may be had to a strong solution of lunar caustic (57 per cent.). If, however, these attempts are not followed by rapid improvement, it will be best to remove a portion of the redundant urethral tissue by means of Emmet's "buttonhole" operation, which is fully described in the section on Urethral Prolapse.

(*b*) *Urethrocele*, partial or saccular dilatation of the urethra, is an uncommon affection, and yet highly important because capable of producing very serious results. The dilatation may be at either orifice or in the middle portion of the urethra; and it is with the latter variety that we are now chiefly concerned, since the two former are almost invariably secondary to calculi or tumors. Dilatation of the middle portion presents two distinct forms, according as the tumor which protrudes from the urethro-vaginal septum represents simply a bagging of the inferior urethral wall or a diverticulum which communicates with the urethra by a more or less contracted orifice. In either case the upper wall of the urethra may deviate but slightly, if at all, from its normal course, or it may in the former more diffuse variety of dilatation prolapse somewhat into the cavity of the sac, and the whole urethral canal may be somewhat lengthened and tortuous. The interior of the

sac is lined with a greatly thickened and inflamed mucous membrane, which may also be the seat of numerous erosions and ulcerations. A urethrocele may be as large as a good-sized hen's egg.

The ETIOLOGY of urethrocele is by no means perfectly clear. With regard to the diverticular form, the most probable supposition is that a cyst of the urethral wall, very likely congenital, has subsequently opened into the urethral canal: Englisch[1] has given a careful description of these cysts, and established their comparative frequency in the newly born. The formation of a simple urethral dilatation is undoubtedly favored by any nutritive disturbance of the urethral wall or the urethro-vaginal septum. Trauma during childbirth, violent coitus or masturbation, the parturient state, and the flabby condition produced by repeated labors, are all predisposing causes; the same may possibly be said of a subacute urethritis. If under such conditions a slight periurethral thickening at the meatus be acquired as a result of prolonged inflammation, or if great vesical tenesmus be kept up for a long time by fissures, cystitis, or other source of vesical irritation, it is not difficult to understand how an urethrocele might be produced. If there be any organic stricture of the urethra or any mechanical impediment to the free passage of urine, dilatation of that portion of the urethra above the stricture is of yet plainer origin. Still, in most of the cases reported no marked stricture seems to have existed, nor is dilatation often mentioned as a result of stricture when the latter has been found. Urethrocele is most often encountered in women who have borne children.

SYMPTOMATOLOGY.—A simple widening of the urethral meatus causes no inconvenience, although it favors the occurrence of prolapse. Dilatation at the vesical orifice often results in incontinence of urine, which is, however, likely to disappear when the cause of dilatation is removed. When there is a saccular dilatation of the middle portion of the urethra, the collection and retention of urine in the sac soon give rise to troublesome symptoms. The urine becomes ammoniacal, and the irritation of the urethral wall soon develops a urethritis. With the impaired nutrition of the walls and the constantly increasing violence of the efforts at micturition caused by reflex irritability of the bladder the urethra becomes more and more dilated; this is also favored by the mechanical impediment to the escape of urine which results from counter-currents in the distended sac. With every micturition the stretching of the sac gives rise to cutting, tearing pains which continue long after the act itself is finished, and the sac receives a fresh supply of urine to dribble constantly from the meatus during the intervals, or to be suddenly expelled, to the unspeakable annoyance of the patient, whenever a cough or sneeze or other like effort causes sudden pressure upon the tumor. Soon the inflammation creeps up into the bladder; its contents

[1] *Med. Jahrbüch. d. K. K. Gesell. d. Aertze in Wien*, 1873, Heft ii.

become alkaline, and all the symptoms of cystitis are added to the already deplorable condition. There may be actual incontinence of the vesical sphincter.

If, however, the urethrocele has only a narrow communication with the urethral canal, the symptoms are somewhat modified. There will still be more or less dribbling of urine, and the walls of the sac will become inflamed; but the urethra itself remains for a long time comparatively healthy, cystitis may not supervene, and the dysuria may be of a more paroxysmal nature: this latter seems to be due to a varying condition of the opening, which at one time permits the free entrance of urine—again remains closed, sometimes for several days.

Examination of a woman with urethrocele will disclose a tumor of the urethro-vaginal septum protruding more or less from the introitus vaginæ, and liable at first sight to be mistaken for a cystocele. Its size may equal that of a hen's egg. It is covered with comparatively healthy vaginal membrane, is soft and compressible, and on firm pressure a thick, cloudy, or purulent urine is made to escape from the meatus. A sound may be passed downward into the sac, so that its beak can be felt at the lowest part of the tumor, or it may be carried straight backward along the superior urethral wall into the bladder. The endoscope may show the walls of the sac to be thickened, congested, and covered with erosions and granulations.

The DIAGNOSIS is not attended with difficulty. We can easily distinguish between the two forms described as dilatation proper and an urethral pocket or diverticulum. In the latter the sound will engage with more or less difficulty—perhaps in the constricted opening of the sac, and once within the latter its antero-posterior motion will be limited. If the dilated urethra is at the same time dislocated downward, the sound can no longer be passed straight backward from the meatus to the bladder, as in simple urethrocele. To distinguish from cystocele complicated with urethral dislocation we have only to remember that reduction of cystocele by pressure will never cause the escape of urine at the meatus, and that with cystocele the catheter must be passed at least an inch before urine will flow. A periurethral abscess which has opened into the urethra can be recognized by its acute origin and its more indurated walls.

The PROGNOSIS will depend upon the complications. If there is a simple urethral diverticulum, with no bladder complications, or a saccular dilatation of which the cause is evidently organic stricture or a tumor, and no cystitis of very long standing is present, we may feel quite sure that treatment will prove successful. When there is no removable cause, and a chronic cystitis has developed which may already have led to serious organic changes in the vesical walls, or possibly in the kidneys themselves, the prognosis must necessarily be guarded.

TREATMENT.—In both forms of urethrocele, whether saccular or diffuse, the first step in the treatment should be to lay open the sac at its most dependent portion by a longitudinal incision through the urethro-vaginal septum. In case of a narrow-mouthed diverticulum, where the urethral walls beyond the limits of the sac are not much inflamed, the redundant tissues—or, in other words, nearly the whole sac—may be excised and the wound closed at once with silver sutures. When, however, the dilatation is more diffuse and complicated by a higher grade of urethritis, the incision should be left open both for the purpose of draining the cavity of the urethra and for convenience in the application of remedies to the diseased surface. These will consist of the various astringents and caustics mentioned under the Treatment of Urethritis, and, above all, in frequent and thorough douching of the urethra with hot water. Under the influence of the latter and free drainage of the sac the tissues rapidly acquire a more healthy appearance and the dimensions of the tumor become greatly diminished, so that eventually the fistula may be safely closed in the usual manner, any remaining excess of tissue being at the same time excised. Any cause of vesical irritation outside the bladder, or any mechanical obstruction at the meatus, must of course be recognized and removed. When the urethrocele is complicated by a chronic cystitis, it will usually be advisable to relieve the latter at once by a vesico-vaginal incision in addition to that of the urethra.

2. URETHRAL STRICTURE.

Organic stricture of the female urethra of sufficient degree to give rise to urinary symptoms is rarely met with. Ricord is of the opinion that more or less contraction is a frequent result of blenorrhœa, but that no stenosis is usually produced, owing to the great dilatability of the canal. An organic stricture may result from any traumatic, inflammatory, or ulcerative lesion of the urethral wall of sufficient extent to produce cicatricial tissue. Such are traumatic injuries from childbirth or operative procedures in the vagina; urethritis, especially the specific form; syphilitic ulcerations, primary or tertiary, and ulcus molle; possibly also lupus. The application of caustics is a very frequent cause, although Ricord regards the great majority of cases as of gonorrhœal origin.[1] The stenosis is most frequent at or near the meatus, although it may occur at the vesical orifice or at any intervening point. A general narrowing of the whole canal sometimes results from its disuse in old cases of vesico-vaginal fistula.

The SYMPTOMATOLOGY may be readily inferred from the nature of the lesion. There will be gradually increasing difficulty of micturition,

[1] Fisseaux: *Ann. d. Gynéc.*, 1879, xi.

the stream will diminish in force and size, and the eventual result may be retention of urine. In other cases micturition may be frequent from reflex irritation of the vesical detrusor; and sometimes there is actual incontinence, which, according to Fisseaux and Blum, may continue even after the stricture is cured. When the stricture is at the upper portion of the urethra near the vesical neck, Skene has observed a difficulty of micturition out of all proportion to the degree of stenosis —a consequence, probably, of greater reflex irritation of the sphincter. As in the male, the eventual result of stricture, when left to itself, is vesical hypertrophy, and later paralysis, with cystitis and hydronephrosis.

The DIAGNOSIS cannot be made from the symptoms alone. The blocking of the urethra by a calculus, a foreign body introduced from without, a new growth or inflammatory œdema; pressure upon the urethra by a prolapsed uterus or other vaginal tumor; dislocation of the urethra so as to form a sharp angle in its course; cicatricial bands in the vagina which cause compression,—these are some of the conditions which give rise to similar disturbances of micturition. In cases also of cystitis and of fissure or congestion of the vesical neck the urine is often passed with great straining and difficulty, owing to spasmodic contraction of the vesical and urethral sphincters, which hinders too the free passage of a sound. If, however, the urine is examined, if the finger is passed along the urethro-vaginal septum in search of a point of thickening, if sounds of different sizes are introduced into the urethra, and any obstruction, its relation to the point of thickening, and the force necessary to overcome it, are carefully noted,—the diagnosis will scarcely be difficult. Fournier has observed that the stricture which results from a tertiary lesion is surrounded by peculiarly dense, almost cartilaginous, tissue.

In stating the PROGNOSIS it must be remembered that incontinence, if present, may persist after dilatation of the stricture, and that a secondary cystitis may have already led to serious renal disease. In uncomplicated cases the prognosis is good, except that in stenosis at the vesical orifice tenesmus is apt to continue even after the normal calibre has been restored.

The appropriate TREATMENT is gradual dilatation with bougies, which need not in most cases be carried beyond No. 15 F. If there be a very dense cicatrix, it may be divided by means of Otis' urethrotome, and the incision kept from closing by the daily passage of a sound. In still other cases where contraction is extreme we may use electrolysis. The negative pole of a galvanic battery is attached to an olive bougie of the requisite size, while the positive pole is put on the patient's abdomen or thigh; the olive is pressed gently against the point of stenosis and the number of cells gradually increased from one up to

the number required to produce an intensity of current equal to fifteen milliampères as indicated by the galvanometer; this application should be made for four or five minutes at each sitting: of the latter, four or five are usually necessary to complete the dilatation, which should be permanent.

3. Dislocation of the Urethra.

The urethra is said to be dislocated when it no longer retains its normal course and position: its calibre is not thereby necessarily altered. The dislocation may be in almost any direction except forward. Most frequently the internal orifice is drawn farther up behind the pubes by the gravid uterus or a pelvic tumor, of which the only result is a somewhat greater difficulty in catheterization. Downward dislocation is the only one which may be followed by serious consequences and which calls for especial description. This form may involve the whole or only the posterior half of the urethra: if partial, a sound will pass for a certain distance in the normal direction, and then be deflected downward toward the vagina; if complete, the course of the whole canal will be directly downward toward the perineum, where the vesical orifice will be situated. The cause of this misplacement is usually a prolapse of the anterior vaginal wall in connection with cystocele or procidentia; it may, however, exist as an independent condition: in either case a ruptured perineum is the usual exciting cause. The anterior vaginal wall, with the urethra, may also be pushed down at labor before the advancing head—a condition which usually remedies itself, but may persist if the perineal support is lost or the patient goes about before involution is fairly advanced. Settling of the uterus after delivery or of an ovarian cyst after puncture may cause the lengthened urethra to double upon itself, so that a sharp angle is formed in its course; such a condition often causes retention, but a catheter may be easily passed if the prolapsed portion be first pushed back by the finger; rest in bed soon enables the parts to regain their tonicity, and recurrence of the dislocation is thus avoided.

The symptoms of downward dislocation are frequent and difficult micturition. After each act a certain amount of urine is retained in the urethra, which may eventually result in urethritis and cystitis. Incontinence is also of common occurrence.

The diagnosis will lie between urethrocele, dislocation, and cystocele. If the latter alone is present, the sound must pass backward through the normal urethra before entering the bladder; and this is also possible in case of urethrocele, while in dislocation the sound is necessarily deviated.

The treatment recommended by Skene,[1] to whose description of

[1] *Diseases of the Bladder and Urethra in Women*, 1878.

this condition we are chiefly indebted, is the application of a pessary which he has devised especially for prolapse of the anterior vaginal wall; this will answer for most cases where there is dislocation of only the posterior portion of the urethra. If the whole urethra is prolapsed, it may be necessary to keep it in position for some days by a vaginal tampon until the tonicity of the parts is improved and a pessary alone is sufficient. If these attempts fail, we may resort to an operation employed by Emmet, by means of which the vesical orifice of the urethra is drawn up toward the cervix uteri.[1] With the patient in Sims' position that part of the anterior vaginal wall indicated by the darkened portion of the figure is dissected off, and the opposite edges of the denuded surface united with deep silver sutures: the first suture connects A and B, while the others radiate somewhat from the lower to the upper edge.

Fig. 147.

4. Prolapse of the Urethral Mucous Membrane.

While a slight protrusion of the membrane at the lower margin of the meatus is of common occurrence, a sufficient prolapse to produce a marked tumor is rarely met with. A flabby condition of the tissues of local or general origin or a dilatation of the urethral canal undoubtedly favors its development; but an exciting cause must usually be sought in some source of vesical or rectal irritation, and consequent straining at micturition or at stool. Vesical calculus and cystitis, vesical and anal fissure, hemorrhoids, uterine displacements, and in children rectal parasites and prolonged spells of coughing, will therefore enter oftenest into the etiology. Prolapse is usually of gradual development, but may be extremely acute; in one case a tumor of considerable size, and representing simply a urethral prolapse, appeared for the first time after a long walk in a woman who had always been free from any such trouble. The great majority of cases have occurred either in young girls from three to fifteen years of age of hysterical or chlorotic type, or in the old and debilitated.

The prolapse may involve the whole meatus or only a limited, usually the lower, portion of its circumference. In the former case the urethral orifice will be in the centre of the tumor, in the latter at its

[1] *Op. cit.*, p. 383.

periphery. The prolapsed portion may be swollen and œdematous, and its surface fissured and bleeding so as to have every appearance of a new growth. In some cases the prolapse represents simply a redundancy of mucous membrane about the meatus, while in others of more recent origin there is an actual displacement of the whole canal, the parts about the vesical orifice also changing their position.

This condition of prolapse tends to increase any vesical tenesmus or dysuria which may have already existed. The efforts at micturition become more frequent and painful as the obstruction at the meatus increases and the urethra becomes inflamed. Cystitis may eventually result, and thus the case acquire a decidedly serious character. The condition is analogous to rectal prolapse, inasmuch as there is in both a typical *circulus vitiosus*, the prolapse increasing with the tenesmus, and the latter becoming more and more severe in proportion to the extent of prolapse.

The character of the tumor varies with the length of time that it has been down. If recent, it may still have the pink color and moist appearance of healthy mucous membrane. After a certain time has elapsed it will be dark red or blue, and denser to the feel; its surface becomes dry and glistening, or perhaps excoriated by constant friction, and hence extremely sensitive.

The DIAGNOSIS between this condition and the various new growths which may appear at the meatus is not usually difficult. A circular prolapse is sufficiently characterized by the presence of a central opening. With the other forms the possibility of reduction, the only moderate sensitiveness of the tumor, its compressibility, the folds and perhaps glands which reveal the character of the surface, should be especially noted; moreover, in cases where reduction is impossible the treatment does not differ from that which should be pursued in case of tumor.

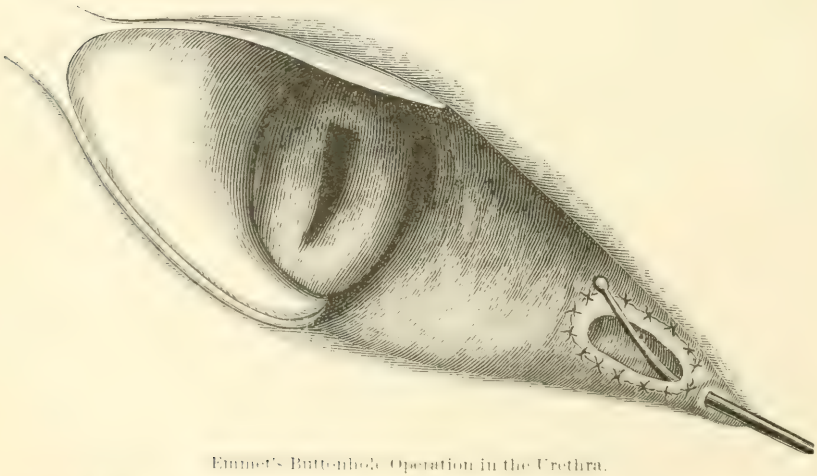
TREATMENT.—When the prolapse is recent, we should first attempt to effect reposition by means of gentle pressure with the fingers, aided, if necessary, by a large sound, which may be carried carefully backward into the bladder, and in case of success cautiously withdrawn. Reposition may also be possible in some cases of long standing, especially if the prolapsed portion be first reduced in size by the application of astringents and hot douches. If reduction is effected, rest in bed must be enjoined until the urethral canal has been made to retract by the topical use of tannin bougies, strong tincture of iodines, lapis mitigatus, or impure carbolic acid, according to the condition of the mucosa. Meanwhile, any cause of vesical tenesmus or other straining effort must receive appropriate treatment: we must not neglect to pass a sound into the bladder, since a vesical calculus may be the origin of the whole trouble. If the prolapse recurs at any subsequent mictu-

rition, it must be at once replaced—possibly a Goodman catheter left for a time in the bladder.

If these attempts fail to cure, the prolapsed portion should be excised or Emmet's buttonhole operation should be performed. For the former, which is best confined to irreducible cases, Winckel prefers the knife and operates as follows:[1] A sound is passed into the bladder, and the tumor is fastened on each side close to the sound with tenacula to prevent subsequent retraction of the membrane into the urethra; the tumor is then excised external to the tenacula, and the two edges of mucous membrane are stitched together with silver wire. Emmet passes a double thread through the base of the tumor, ties each half, and excises close to the ligature. Another good method is with the galvano-cautery loop.

Excision is most suitable where there is simple redundancy of the tissues about the meatus. If, however, the whole urethra is dilated and its whole membrane stretched and voluminous, the superfluous portion may be removed by what is known as "Emmet's buttonhole operation:"[2] a slit is made in the middle of the urethro-vaginal septum down to the urethral mucosa, not through it; a fold of the latter, representing the excess of tissue, is then drawn through the slit by means of tenacula and fastened by a suture at each angle. This fold is then

FIG. 148.



Emmet's Buttonhole Operation in the Urethra.

excised close to the septum, and the opening closed by still other sutures which include both vaginal and urethral membranes; or it may, in case of urethritis, be left open for purposes of drainage and topical applications, and closed at a future operation.

[1] *Op. cit.*, p. 13.

[2] *Op. cit.*, p. 729.

§ 2. DISEASES OF NUTRITION.

1. Urethritis.

Probably the great majority of cases of urethritis are of specific origin and secondary to gonorrhœal infection of the vagina. Sigmund found in 763 cases of gonorrhœa in the female 476 of vaginitis and urethritis together, 282 of vaginitis alone, and only 5 of uncomplicated urethritis. Still, congestive and inflammatory conditions of the urethra of non-specific origin are by no means uncommon, and may result from a great variety of causes. Many cases seem to be due to exposure to cold; others result from the irritation of certain urinary constituents, such as uric acid in gout or pus in cases of pyelitis; still others result from actual trauma, such as occurs with the passage of calculi, with the introduction of foreign bodies from without, with violent coitus, or a severe labor. Another important factor in the etiology is the intimate relation between the periurethral plexus and the blood-supply of the other pelvic organs; thus we often find a mild form of urethral catarrh accompanying malpositions or fibroids of the uterus, while during the period immediately preceding menstruation there is often an exacerbation of any existing urethral inflammation, which is in turn relieved by the establishment of the flow. Again, the urethra is apt to participate in the various catarrhal affections of the vulva and vagina, especially the vulvitis of scrofulous children. Finally, a urethritis may sometimes appear in the course of the exanthemata, the specific lesions of measles, scarlet fever, and smallpox having all been found upon the urethral mucous membrane.

The symptoms in recent cases are chiefly burning pain and smarting at micturition. This may lead to voluntary retention, but more frequently irritation of the vesical neck causes the urine to be voided somewhat oftener than usual, or there may, especially with the gonorrhœal variety, be veritable tenesmus. Local examination discloses a red pouting meatus; the whole urethral canal is swollen and sensitive, causing partial obliteration of the canal and rendering catheterization painful or even impossible. Vaginal pressure along the urethra may cause a purulent fluid to escape at the meatus, and micturition is often followed by the appearance of a few drops of blood. In ten to twelve days the pain subsides, the purulent discharge becomes less copious, and the disease, even if let alone, shows a natural tendency to disappear in the course of four or six weeks from the date of its first appearance. Such is the ordinary course of specific urethritis, which is, however, usually more or less masked by the accompanying vaginitis, and becomes more prominent as the vaginitis disappears. Owing to the shortness of the urethra and the ready escape of inflammatory secretion there is much

less tendency to cystitis than in the male, and the whole course of the disease is much less virulent. In the simple or non-specific form the symptoms are still milder: there may be scarcely any purulent discharge, and the affection may disappear entirely under treatment in the course of a very few days.

Now and then acute urethritis gradually assumes a chronic character, or the disease may take a subacute form from the outset. Pain at micturition is then much less or entirely absent, and a drop or two of thin muco-purulent discharge can be pressed from the meatus only when an hour or more has elapsed since the last passage of urine. The urethral walls become greatly thickened, and may be felt on vaginal examination as a hard cord of induration, sometimes as large as the finger. The mucous membrane is also covered in some cases with granular erosions or even ulcerations. There may be also a varicose condition of the veins at the meatus, and the mucous membrane may be more or less prolapsed, or, if the case is of specific origin, the urethral orifice may be the seat of several condylomata. Now and then urethritis is complicated by the formation of a periurethral abscess.

Diagnosis.—It is thus seen that urethritis may exist in very varying degrees, and that the diagnosis will not always be easy. The acute specific form will present the least difficulty: it is generally accompanied by an intense purulent inflammation of vulva and vagina; the smarting and tenesmus are often excessive, and after the third or fourth day there is a thick, purulent discharge from the meatus. Non-specific urethritis, such as results from trauma or exposure to cold, may likewise be of sudden onset, but the discharge never consists of pure pus, and is usually scanty or entirely wanting. In the chronic and subacute forms the diagnosis must be made by means of the endoscope and other methods of physical examination. The only disease with which acute urethritis is likely to be confounded is cystitis: in the latter there is greater vesical tenesmus, the constitutional effects are more marked, and pus escapes from the urethra only at micturition instead of in the intervals.

The treatment of a fulminant urethritis, such as accompanies a vaginal gonorrhœa or follows exposure to cold, should be at first chiefly palliative, and consist of mucilaginous drinks, warm sitz-baths, hot vulvar and vaginal douches, and opiates if necessary; when cold is the cause, hot mustard foot-baths, mild catharsis, and diaphoretics will be beneficial. After eight or ten days, when the pain and smarting have grown considerably less, we may begin the use of astringents. We may employ gelatin suppositories, each containing gm. .20 of alum, or gm. .06–.10 of tannin, or gm. .03–.06 of sulphate of zinc; and of these, one should be inserted daily. Or the urethra may be douched by means of Skene's reflex catheter; and of the various astringents which may be

used the following combination of Ultzman is one of the most valuable we possess:

℞. Aluminis,
Zinci sulphatis,
Acid. carbolici, āā. .50–1.00;
Aq. dest. 400.

Of this solution gm. .50–1.00 should be injected once or twice daily; like all other topical treatment of the female urethra, this must be applied by the physician himself. Instead of a reflex catheter, which must be inserted as far as the vesical orifice, a syringe may be used with a mouth wide enough to cover the meatus, and not requiring insertion: the finger may be pressed against the vesical neck while the injection is being made, to prevent the entrance of fluid into the bladder. Small injections may also be made with the ordinary "P" syringe.

Subacute catarrh often disappears of itself as soon as the irritation or impeded circulation which causes it has been corrected. If not, the various astringents may be used as above recommended. If the urethritis is chronic and mild means have proved unavailing, the urethral mucosa should be thoroughly brushed with a 3 to 6 per cent. solution of nitrate of silver. Winckel recommends the lapis mitigatus, and even the solid stick has been used by some with good effect. In cases of granular erosion impure carbolic acid is a less painful application than the solid stick or strong solutions of silver, and its use has proved very effectual.

2. Urethral Ulcerations.

Typical ulcerations are not at all uncommon in the female urethra, most often as a result of urethritis, when they are usually accompanied by other spots of granular erosion: the latter is a term applied to more or less circumscribed patches of mucous membrane which are of a brighter red and more granular appearance than the other parts, and represent losses of the upper epithelial layers with hypertrophy of the underlying papillæ. Less frequent are primary and secondary syphilitic ulcerations and ulcus molli. Among 244 cases of soft chancre in women Lewin found 6 of urethral ulceration alone, and 5 others of the latter combined with ulceration of the genitals. Urethral ulcerations may also be of lupoid, tuberculous, or cancerous origin: the former is always an extension simply from lupus of the external genitals. There is still another form of urethral ulceration, described first by West and later by Duncan, Schmarbeck, Schroeder, and others,[1] which is met

[1] *Vide* Ehrhardt: *Ueber ch. ulcerat. d. weib. Harnröhre*, Berlin. 1884.

with chiefly in prostitutes, and results from frequent attempts at coitus where the vagina is so small and contracted that the penis cannot effect an entrance. The ulceration is thought by some to be of specific origin, but usually no other signs of syphilis are to be found. The region of the meatus and the fossa navicularis become at first excoriated, then ulcerated, and the destruction of the urethra may be so extensive in severe cases that there remains only a cone-shaped excavation, with its apex at the vesical orifice and its base representing the greatly enlarged and gaping meatus.

Symptoms.—These ulcerations and erosions may cause great vesical irritability and tenesmus, with burning pain at micturition. These symptoms are often out of all proportion to the small erosion which may constitute the only lesion, and are largely of reflex nature. In the cases of extensive ulceration associated with narrow introitus vaginæ, micturition is painful and very frequent, or there may be actual incontinence; the surface of the ulcer is also extremely sensitive. Most of these ulcerations can only be detected by the use of the speculum or endoscope. A soft chancre may perhaps be recognized as such by the presence of similar lesions upon the genitals or by inflamed inguinal glands.

The diagnosis of a syphilitic lesion will depend upon the induration of the underlying tissues and the constitutional symptoms. Lupoid and malignant ulcerations are very rare, and almost invariably secondary to like disease of the vulva.

Treatment.—A syphilitic ulcer demands the same local and constitutional treatment as when found in other situations. A granular erosion or catarrhal ulceration should first be treated by the daily insertion of a urethral suppository containing gm. .20–.30 of iodoform. If improvement does not follow this treatment, the ulceration should be touched occasionally with a 5 per cent. solution of silver or with impure carbolic acid: for this purpose we may use Skene's speculum or one of the various ear and nasal specula; possibly separation of the urethral walls by means of our ordinary dressing-forceps may suffice. To render the application less painful it may be preceded by the insertion of a urethral suppository containing gm. .03–.06 of cocaine. The same treatment may be pursued in cases of urethral chancroid. The form of ulceration found in prostitutes is best treated by douches and astringent washes or powders, or in severe cases by the Paquelin cautery.

3. Catarrh of Skene's Glands.[1]

These glands may participate in either simple or gonorrhœal catarrh of the vulva or urethra. While the non-specific form does not tend to

[1] *Trans. Prov. Med. Soc. King's Co.*, 1880, v. p. 333.

persist, and usually requires no special treatment, the gonorrhœal affection first becomes noticeable after the inflammation of the neighboring parts has subsided. The mouths of the glands then appear as small yellow points surrounded by hypertrophied and usually slightly prolapsed tissue, so as to present at the meatus every appearance of a urethral caruncle. These tissues are also very sensitive, and give rise to great pain on walking or even sitting. Occasionally there is irritable bladder, although this symptom is by no means as frequent as urethral caruncle. There is usually some smarting at micturition. As long as these glands continue to be the seat of a gonorrhœal inflammation the patient is subject to constantly-recurring exacerbations of general urethritis.

The great tenderness at the urethral orifice, which is the most prominent symptom, together with the discovery of a small tumor at the meatus, makes the condition quite likely to be mistaken for caruncle. The mouths of the glands should always be carefully searched for, and when found they should be watched while pressure is made against the anterior vaginal wall just behind the meatus: this will cause the escape of a drop of pus in case of catarrh, and thus establish the diagnosis.

Besides these secondary affections, Skene believes these glands to be sometimes the seat of primary tuberculosis. The symptoms and appearances presented do not differ at the outset from those of the gonorrhœal variety just described. There is, however, no history of gonorrhœa to be obtained, while a secondary urethritis soon makes its appearance, and the glands may ulcerate or become caseous—conditions which never follow the gonorrhœal form. Terillon[1] also has recently observed that certain cases of urethral caruncle are very prone to recur after extirpation, and that just these cases are frequently followed by a general tuberculosis of the urinary organs. Whether these recurrent "fungoids" of Terillon are really the tuberculous and inflamed glands of Skene remains to be confirmed by other observers. In case ulceration, resistance to treatment, and absence of gonorrhœal history should arouse suspicion of tuberculosis, the pus secreted by the glands should be examined for the tubercle bacillus and the prognosis be somewhat guarded.

The TREATMENT of inflammation of these glands which has thus far proved universally successful[2] is to slit up the glands along their urethral aspect by means of a pair of fine-pointed scissors, followed by topical applications of Churchill's tincture of iodine, or by packing the cavity of the gland with cotton saturated with perchloride of iron. This will effect a rapid and permanent cure, except in the very rare cases of tuberculosis.

[1] *Progrès méd.*, Paris, 1880, viii. p. 101.

[2] Skene: *op. cit.*; also Reed: *Chic. Lancet*, 1875, xiv. p. 76.

§ 3. NEW GROWTHS.

Urethral tumors are known under the various names of vascular tumors, fungoid excrescences, urethral polypi, and caruncles. These different names represent in part material differences in structure which may be best understood by adopting, with Winckel, an anatomical classification according to the particular tissue from which these tumors develop. The following forms may be met with:

Condyloma;
Papillary angioma and varix;
Cysts and myxadenoma;
Fibroma;
Sarcoma;
Epithelioma.

(*a*) Of these, the malignant forms, sarcoma and epithelioma, are of the least importance, because of their extreme rarity. Sarcoma has been only once observed, in the form of a walnut-sized tumor at the meatus.[1] Epithelioma is probably never primary in the urethra, and very rarely secondary to cancer of the vulva or internal genitals: a form of periurethral cancer has, however, been described by Melchiori,[2] which begins as a small painless tumor of the vulva, and extends along the periurethral cellular tissue without involving the urethral mucosa; later, ulceration of the meatus may supervene.

(*b*) Myxadenoma, commonly called mucous polyp, is also seldom encountered in the urethra. These tumors are quite similar in structure and appearance to the well-known mucous polypi of the rectum and uterus; they are not especially painful, are of bright-red color, and have a smooth surface; they may grow from the meatus or from the deeper portions of the urethra.

Urethral cysts have been described by Englisch[3] as of not infrequent occurrence at birth, when they may project into the urethral canal so as to partially occlude its lumen, or lie entirely concealed in the urethro-vaginal septum. Their situation is usually on the urethral floor near the meatus; their inner wall is covered with hypertrophied papillæ, which makes it probable that they are simple retention-cysts either of the follicles of Morgagni, or more often, perhaps, of Skene's glands. These cysts persist now and then into adult life, and may reach a very large size, so as to form extensive vulvo-vaginal tumors, which are found to be separated by only a very thin wall from the urethral canal, and form occasionally a mechanical impediment to the passage of urine: their possible connection with certain forms of urethrocele has already

[1] Winckel: *op. cit.*, p. 53.
[2] *Vide* Blum: *Arch. gén. de méd.*, 1877, p. 129.
[3] *Wiener med. Presse*, 1881, p. 599.

been alluded to. Simple retention-cysts are also found occasionally in adults near the vesical orifice.

(*c*) Fibroid tumors are scarcely more frequent than the forms hitherto described. They are solid connective-tissue tumors, either sessile or pedunculated, of smooth or lobulated exterior, and sometimes as large as a hen's egg: they may grow from any portion of the urethral canal, and their importance is, as a rule, in direct proportion to their obstructive character.

(*d*) Varices, or urethral hemorrhoids, may be found only at the under border of the meatus, or, more rarely, along the whole urethral floor. The dilated veins may cause the mucosa to protrude in the form of bluish-red tumors analogous to those of the anus. These tumors are smooth, slightly sensitive to the touch, and have a tendency to bleed very readily; the passage of a sound will sometimes give rise to excessive hemorrhage.

(*e*) All these tumors are similar in structure to analogous tumors of other organs, and are none of them especially painful; they are therefore of more or less insignificance, both clinically and anatomically, as compared with the much more frequent and painful tumors to which Winckel has given the appropriate name of "papillary angiomata." These growths are peculiar to the female urethra, and are commonly known as irritable urethral caruncle. Verneuil was the first to describe their histological structure, and Virchow, Wedl, and Reid have also made them the object of considerable study.[1] They grow usually from the inferior border of the meatus, but may, however, occupy any portion of its circumference or be situated higher up in the canal. They may be sessile or stalked, are usually single, sometimes multiple, and of bright-red or bluish color; they are rarely larger than a pea, have a granular surface, bleed readily on touch, and are extremely sensitive. Anatomically, these growths represent hypertrophied papillæ and contain an enormous number of vascular loops.[2] The walls of the latter are not thickened, nor are they ectatic, thus differing from those of an ordinary telangiectasis; still, the tumors are undoubtedly to be reckoned among the angiomata, since a rich development of blood-vessels is their most striking feature. The papillæ are covered sometimes with cylindrical, usually with pavement, epithelium, and contain, according to Reid, a rich supply of nerve-filaments.

Etiology.—Not much is known as to the etiology of urethral tumors. Papillomata are rarely found before puberty; hence the circulatory disturbances attending menstruation and childbirth may be held in some way responsible. Englisch thinks he has found a predisposing element in the hypertrophied papillæ of the cysts already described; he believes that the cysts rupture soon after birth, but that

[1] *Op. cit.*, p. 55.

[2] Virchow: *Geschwülste*, iii. p. 463.

with the beginning of menstruation these hypertrophied papillæ receive a fresh impetus to further development. Possibly inflammation of Skene's glands may have the same predisposing influence: the neighborhood of their mouths is certainly the most common seat of caruncle. Scanzoni and others regard all cases as of gonorrhœal origin. With reference to the other urethral tumors, it need only be mentioned that urethral hemorrhoids often originate in uterine dislocations and other like causes of venous stasis.

Symptoms.—With the exception of the papillary angiomata and the rare cases of malignant disease, urethral tumors are important only in so far as they form an obstruction at micturition, or if the tumor prolapse from the meatus it may become fissured and excoriated, and thus give rise to scalding and itching at the vulva, or possibly to masturbation. The results of obstruction will be the same as those described under Stricture, and need not again be detailed.

With papillary angioma a train of symptoms and consequences results, which bears no relation to the apparent insignificance of the tumor, and which may have a serious effect upon the constitution of the patient. These growths are characterized by their exquisite sensitiveness to touch and to the contact of urine. A caruncle no larger than the head of a pin may cause the most intolerable agony with each act of micturition. This pain may be simply the result of friction of the stream against the tumor; but more often the distress is greatly augmented by a reflex vesical spasm, which renders micturition extremely difficult and painful, at the same time that its frequency is increased. The vaginal sphincter also participates in this reflex irritability, and a permanent vaginismus often renders coitus absolutely impossible; the same is true of digital examination or any attempt to introduce an instrument into the urethra or vagina. Walking, or even sitting, is painful to these patients, especially when the tumor protrudes more or less from the meatus. Hemorrhage from the growth is a prominent symptom in many cases, and a high grade of anæmia is often produced. Eventually, the appetite begins to fail, the sleep is broken, and this, together with the constant worry and distress and the not infrequent hemorrhage, may reduce the patient to a condition of physical and nervous exhaustion and debility such as is usually found only with serious constitutional disease. According to the writer's experience, there is no affection of the genito-urinary system capable of producing such a total wreck of the nervous system, such a condition of utter misery, as urethral caruncle. In rare cases the long-continued vesical irritation terminates in cystitis.

Diagnosis.—Any growth at or near the meatus is not likely to be overlooked if a vesical examination is made while the lips of the meatus are held apart with a pair of dressing-forceps or a Jarvis speculum.

The distinguishing features of the various urethral neoplasms have already been sufficiently described. Other lesions with which such a tumor at the meatus might be confounded are vesical polyp, prolapse of the urethral or vesical mucosa, and hypertrophy resulting from catarrh of Skene's glands. The latter may be recognized by the swollen hyperæmic condition of the mouths of the glands, and the escape from them of purulent secretion under pressure of the finger against the septum. Urethral prolapse can usually be reduced, is seldom very sensitive, and often forms a complete ring with a central opening. A pedunculated tumor which appears at the meatus may be taken for a prolapsed vesical polyp or vesical inversion, although the mistake has usually been reverse: whenever a tumor is found protruding at the meatus which has no evident attachment to the urethral wall, attempt should be made at reduction, and in case of vesical inversion or prolapsed polyp this will almost invariably succeed.

Tumors of the deeper portions of the urethra are not always so easily discoverable. A papillary angioma in this unusual situation would hardly fail to cause severe pain when pressure is made along the urethro-vaginal septum. Fibromata may be easily felt from the vagina. A soft mucous polyp is most apt to escape detection, and if endoscope and speculum fail to discover any lesion in spite of decided symptoms of urethral irritation, Emmet's method of examination may be employed, as described in Part I.

Prognosis.—Fibrous and mucous polypi show no tendency to recur after excision. Condylomata do have this tendency to a slight degree; they have, however, but little clinical significance. Cysts are always susceptible of radical cure, while sarcoma and epithelioma are subject to the same laws here as elsewhere. Varices can usually be treated with at least partial relief, and in some cases this will be complete. Papillary angioma often recurs, but in the great majority of cases this may be prevented by proper treatment, and the prognosis is therefore good in the absence of serious complications, such as cystitis, except that in cases of frequent recurrence after thorough extirpation, especially if a purulent urethritis has developed, suspicion of possible tuberculosis should be aroused.

Treatment.—This consists in removal of the growth and thorough cauterization of its base in all forms likely to recur. These ends may be achieved by several different means, from which a judicious selection must be made in each individual case according to the character of the growth. For all tumors which are easily accessible the method preferred by the author is to seize the growth at its base by means of pressure-forceps, and then to twist or burn off the free portion, using styptic cotton, if necessary, to allay the hemorrhage. If the tumor be sessile and flattened, it may be scraped out with the curette. For polypi

which are attached within the meatus the aural snare is often very efficient. If the tumor is large and vascular, a needle armed with a double ligature should first be passed through the base, and double ligation be followed by immediate excision. With tumors more deeply situated or near the vesical orifice, the urethra may be dilated and the tumor removed by simple torsion, or possibly with snare or curette. Large tumors must be removed by vaginal urethrotomy, a slit being made in the urethro-vaginal septum, through which the tumor can be everted and removed without further difficulty; and in general this method is to be preferred for all growths which are not in the immediate neighborhood of the meatus.

With all tumors it is best to cauterize the base after removal, and with angiomata this must be especially thorough if recurrence is to be prevented. Here, again, the Paquelin cautery is probably the best agent; but the apparatus is not always obtainable, and pure nitric acid is, fortunately, scarcely inferior: a small bit of cotton should be twisted around the end of a wire, wrung out in water, and dipped in the pure acid; it is then applied to the raw surface for about one minute, and afterward neutralized by a saturated solution of bicarbonate of soda. Searing with a red-hot wire is also quite effectual, while the weaker caustics, such as nitrate of silver and carbolic acid, are to be considered inadequate. Sometimes the hemorrhage after the removal of these growths is quite considerable: it is usually checked at once by the cautery; if not, the pressure of a speculum will sometimes avail, or, still better, a small glass tube may be inserted and a little styptic cotton packed in around it; when these fail the vagina should be firmly tamponed, the pressure of the plug being usually an effective safeguard against further bleeding. It is not to be forgotten that the blood may, in exceptional cases, find its way into the bladder, instead of outward through the meatus, and thus a persistent hemorrhage be entirely overlooked; the urine should therefore be watched. In cases where no operation is permitted the application two or three times a week of pure chromic acid, in solution or fused into the end of a probe, is not very painful, and will sometimes cure.

§ 4. FOREIGN BODIES IN THE URETHRA.

These may enter the urethra from the bladder or be introduced from without, or, in rare instances, develop in the urethra itself. Winckel relates a case where a calculus 8 cm. long and 10 cm. in circumference had formed in the urethra around the end of a needle which had been introduced from the vagina. For an enumeration of the various substances which have been introduced into the urethra or passed through it in either direction reference may be had to the section on

Foreign Bodies in the Bladder. Anything in the latter, except bodies of very considerable size, may be expelled through the urethra or become fixed in its course and cause obstruction. Calculi of even several inches in diameter, hydatid cysts, fœtal bones, and vesical polypi are among the things which have been known to escape through the urethral canal.

The SYMPTOMS of a foreign body in the urethra are those of irritation and obstruction, in addition to which there may be hemorrhage from injury of the urethral wall. Later, a urethritis is set up, with possibly ulceration and perforation or periurethral abscess.

The DIAGNOSIS of a foreign body is made by vaginal touch and the sound where no reliable history can be obtained.

TREATMENT.—Removal may be effected in some cases by artificial dilatation and forceps, aided by one or two fingers in the vagina, or a wire doubled like a hairpin may be bent at its end so as to hook down any small body of moderate size and smooth surface. A large calculus which has only partially engaged in the vesical orifice should be pushed back, to be afterward extracted by the ordinary method of dilating with vesical calculi. Any body already through the sphincter, which cannot be easily removed through the meatus without urethral laceration, should be extracted through a urethro-vaginal incision: this may be immediately closed, or in case of urethritis it may be left open to ensure more thorough drainage and facilitate subsequent treatment.

§ 5. NEUROSES.

Improved methods of exploration have shown that the neuralgia and spasmodic contractions of the urethra formerly considered as frequently idiopathic are nearly always results of some urethral lesion or of reflex origin. Cases are, however, now and then encountered which may be termed neuroses in default of better anatomical knowledge, where micturition is attended with pain, such as occurs with urethritis, and with considerable tenesmus. These symptoms are often exaggerated at the time of menstruation, and may disappear entirely in the intervals. We may attempt to relieve these patients by the various urethral suppositories containing cocaine or morphia, with belladonna or hyoscyamus, or by rectal injections of chloral hydrate. Meanwhile, hot vaginal douches should be employed. Occasionally a faulty urine, containing too much uric acid, needs only to be corrected by diluents and salts of lithia or antidyspeptic remedies in order to give relief. It is, however, the general condition of the patient which should receive chief attention, and in addition to the usual tonics general galvanism is to be warmly recommended as being one of the most useful means at our command for re-establishing the tone of the nervous system. There

will usually be found to be some source of reflex irritation of the bladder, and this is of course to be removed as far as possible; still, the pain will often persist in spite of such removal, and permanent cure is not to be anticipated until the general health has been at least partially restored.

IV. DISEASES OF THE BLADDER.

§ 1. ANOMALIES OF FORM AND OF POSITION.

1. Dislocations of the Bladder.

The bladder may be pushed or drawn in almost any direction out of the position which it usually occupies. Two forms of vesical dislocation will, on account of their special significance, be separately described —viz. cystocele and inversion of the bladder: first, however, some of the other more common varieties may be briefly alluded to.

1. A malposition occasionally results from abnormal conditions within the bladder, such as calculi, tumors, or an excessive amount of retained urine. More often the causes of dislocation are to be sought, external to the bladder, in some malposition or lesion of the neighboring organs: the most common of these is the gravid uterus. In the first months of pregnancy the uterus simply falls a little forward as its body increases in weight, so as to cause a slight indentation of the posterior vesical wall. Then as the uterus grows still larger, so that the pelvis can no longer contain it, and it becomes an abdominal organ, the bladder is again relieved of the weight. Later, with the onset of labor and the upward retraction of the cervix uteri, to which the posterior vesical wall is quite closely attached, the vesical orifice is often drawn up to such an extent that it can only be reached by a long male catheter. Here the bladder is flattened out between the uterus and abdominal wall, so that it often contains but a few ounces of urine, in spite of the very considerable dimensions which it seems to have on palpation. An ovarian cyst or large fibroid may draw up the bladder in the same way, and the same retention of urine, from doubling of the urethra upon itself, has been known in several cases to follow the puncture of a large ovarian cyst as follows the shrinking after delivery of the emptied uterus.

Among the sources of increased pressure upon the bladder, the most serious is retroversion of the gravid uterus. In this condition the cervix uteri is tilted up behind the pubes, so as to cause partial or complete occlusion of the vesical neck; the resulting retention of urine and overdistension of the bladder is one of the most common sources of diphtheritic cystitis. The summit of the bladder is displaced not only upward, but backward, so as to partially lie upon the retroflexed uterus.

Malpositions of the non-pregnant uterus, either by direct pressure, as in anteversion and prolapse, or by traction at the vesical neck, as in retroversion, are common causes of vesical displacement. All sorts of uterine tumors, fibroids, hæmatoma, cancer, also periuterine inflammation or hæmatocele, may have the same effect. A fecal impaction in the rectum or sigmoid flexure may cause an indentation of the vesical wall, which, on examination through the dilated urethra, appears like a veritable tumor of the bladder itself; so with ovarian and parovarian tumors or a vaginal tampon or pessary. The bladder may also become adherent to the uterus, ovaries, or intestine, and thus be drawn and pulled upon in various directions; it may even form a part of the contents of a hernial sac.

The SYMPTOMS of these different dislocations vary greatly according to the degree of displacement and certain other factors which are not perfectly understood. If there is any dragging at the vesical neck, there is almost invariably an increased irritability of the bladder which manifests itself by increased frequency of micturition, and in some cases tenesmus, but when there is only moderate pressure upon the bladder from an anteverted uterus, a pelvic tumor, or the like, there is sometimes irritable bladder and sometimes no vesical disturbance whatever. It is very doubtful if a dislocation of the corpus vesicæ alone, without any change in the position, tension, or blood-supply of the vesical neck, is sufficient of itself to cause irritable bladder: that which attends the beginning of pregnancy has been alluded to, but here there is not only a pressure from the growing uterus, but also a marked alteration in the circulation about the vesical neck—a temporary predisposition, as it were, to congestion and inflammation. Complete retention of urine as a result of vesical dislocation is of rare occurrence, except with retroversion of the gravid uterus: this will be again referred to in speaking of the etiology of cystitis.

The DIAGNOSIS and TREATMENT of vesical dislocation must depend entirely upon the recognition and removal of the exciting cause. Usually, vesical irritation, which is the most prominent symptom of dislocation, is only one of a group of symptoms which have a common origin in a dislocated uterus, a pelvic cellulitis, hæmatocele, or the like; and these can only be discovered by a thorough examination of all the pelvic organs. Still, frequent micturition is often the chief complaint made by the patient in such cases, and it is important to recognize the actual cause, and not waste time with diuretics and other internal remedies when, for instance, a well-fitting pessary will give immediate relief. The pressure of the anteverted gravid uterus may sometimes be removed by a hypogastric belt. Toward the end of pregnancy a faulty position of the fœtus may cause an arm or shoulder to press upon the bladder; and this condition may sometimes be remedied by external manipula-

tion of the fœtus. Retention in the early months of pregnancy should always arouse suspicion of a retroverted uterus, and lead to timely recognition and correction of the malposition.

2. Cystocele Vaginalis.

In this condition a part, and in some cases the whole, of the bladder is prolapsed or everted through the vaginal outlet. It may occur suddenly in consequence of violent expulsive efforts, such as accompany childbirth, but usually it is of slow development. As a rule, the bladder itself is not at fault, or at most merely predisposed to prolapse. Any straining effort, such as attends constipation, or prolonged fits of coughing, or severe vesical tenesmus, must favor the formation of a cystocele. Vesical calculus also, or vesical tumors, may occasionally, on account of their weight, be predisposing factors. The most important cause is unquestionably a loss of the perineal body, which permits a rolling out of the vaginal tissues, and a consequent dragging upon the parts to which they are closely attached. Attention has already been called to the more or less intimate union of the anterior vaginal wall to the fundus vesicæ; and it is easy to see how a sagging of the former would result in the formation of a constantly enlarging vesical pouch. Still, this sagging does not always follow a loss of the perineum, and a further cause for its occurrence is to be sought in a subinvolution of the vagina and too early rising from confinement before the parts about the introitus have regained their normal dimensions and tone.

Cystocele may exist alone or as a part of a procidentia; in some cases the cystocele precedes the uterine prolapse; more rarely the anterior vaginal wall, and with it the bladder, is dragged down by the prolapsed uterus. Still, cystocele is not a necessary consequence of procidentia, which may even be complete and yet the bladder retain its normal position; this seemingly impossible condition is brought about by the gradual stretching of the vesico-uterine and vesico-vaginal attachments.

Cystocele may occur at almost any age, but since it is in nearly every instance a result of childbirth, it is extremely rare before puberty: Bourdon, however, found it at the age of fourteen, Cooper at seventeen, and Markoe in a child of only four years: the latter was an acute case, and represented a true hernia vesicæ vaginalis in consequence of straining at stool. The degree of vesical prolapse may vary from a small pouch hardly visible at the vaginal orifice to a tumor the size of a fœtal head which lies outside the vulva and represents the completely inverted bladder. Meanwhile, the urethra may retain its normal position, or its vesical orifice may, on the other hand, be so completely prolapsed that the usual relative position of its two extremities is almost reversed, the vesical orifice being, in the erect posture, considerably anterior to

the meatus. (For a more complete account of the complications from the side of the uterus and rectum the reader is referred to the article of this work on Procidentia.) In most cases of cystocele the uterus is not much lower in the pelvis than usual.

The SYMPTOMS of the acute form are a sensation of great stretching and tearing at the vulva, such as occurs at the termination of labor, with sometimes a feeling of tension at the umbilicus. Most of these cases have occurred during labor, when the resulting symptoms would not be so noticeable; it is, however, an unusual accident. In the chronic form the symptoms are more manifold, but it will be sufficient here to mention only those which are purely vesical. Micturition may be quite free and natural in spite of considerable prolapse; oftener it is very frequent, even two or three times hourly. The bladder is emptied with much difficulty and straining, and often the patient is obliged either to assume the genu-pectoral position or to push back the tumor into the vagina before micturition can take place. Occasionally the cystocele is complicated with cystitis, but much less frequently than would naturally be expected to follow the almost unavoidable retention of a certain amount of urine in the sac: Winckel, for instance, did not encounter one case of cystitis among sixty-eight of cystocele, and with other authors also the proportion of cases thus complicated seems to have been very small. The formation of a calculus in the sac is also rare. Inflammation and excoriation of the vaginal surface of the tumor, exposed as it is to chafing from the clothing and other sources, together with dragging pain in and about the tumor, especially when its vesical wall is inflamed and ulcerated, attend this as well as other forms of vaginal prolapse.

DIAGNOSIS.—An uncomplicated cystocele forms a soft elastic tumor, not especially tender on pressure unless inflamed, increased in volume when straining efforts are made, and usually reducible after catheterization or disappearing entirely of itself when the recumbent posture is assumed. The latter fact often makes it necessary to examine the patient while standing, in order to determine the full extent of the prolapse, or even in some cases its existence; or the same effect may be produced if the patient makes a straining effort, as when at stool. The catheter must be passed at least an inch before urine flows, and its beak can then be carried to the most dependent part of the cystocele, where it can be easily felt. A certain amount of urine is nearly always retained in the sac, as may be shown by catheterization immediately after micturition has taken place. These characteristics are so marked that it seems hardly possible to mistake such a tumor for anything else; still, in an acute case occurring during labor it has been taken for the bag of waters; and it has also been punctured under the impression that it was a hydrocephalic head. Such blunders are only possible

when the examination is cursory and there is ignorance of the fact that an acute cystocele may complicate labor. In all cases the catheter or the sound is the most reliable means of diagnosis.

Cystocele of recent development and uncomplicated by uterine prolapse is completely curable. When of long standing it can also be relieved in most cases, and even where the degree of uterine prolapse is considerable the prognosis is by no means hopeless.

Treatment.—In an acute case reposition of the prolapsed tissues, with a vaginal tampon if necessary to hold the parts in place, and rest in bed, are usually sufficient to prevent any recurrence. In chronic cases the first question of treatment will be as to the presence and extent of complications. If, luckily, there are none, if the perineum is nearly or quite intact and the cystocele small, it may sometimes be induced to retract by the use of vaginal douches of hot water; and these should be continued for at least a month before resort is had to other measures. If douching fails, one of the various pessaries may serve to keep the bladder in place; and of these Skene's is to be highly recommended, also Emmet's modification of a Hodge. Chronic cystitis, if present, should be cured before any operation for the cystocele itself; and here the formation of an artificial vesico-vaginal fistula at the most dependent part of the tumor is usually the means to be adopted at once as the surest and most satisfactory. For the more aggravated forms of cystocele it will usually be necessary to do perineorrhaphy and kolporrhaphy, and perhaps supplement these operations by the fitting of some mechanical support for the uterus and vagina. (For a description of these operations and the various pessaries which may be used in Procidentia the reader is referred to the article on this subject.)

3. Inversion of the Bladder.

This form of vesical prolapse, where the summit of the bladder, which in the empty state lies directly upon the internal urethral orifice, has become inverted through the latter so as to appear at the external meatus, is an extremely rare occurrence. Only two or three cases in adults have been reported, while in children the number of observations is somewhat greater. It is sometimes of acute origin, brought on by a fit of coughing or by straining at stool or micturition, or in children by crying. More often, however, it develops slowly, gradually dilating the urethra, until at last a tumor appears at the meatus, which recedes between the straining spells, but in time becomes larger and larger, until perhaps the whole everted bladder lies at the vulva. Here also, as in the acute form, the exciting cause is to be sought in a series of violent expulsive efforts. Some authors have thought it necessary to suppose a congenital laxity or perhaps malformation of the urethra;

still, the children in whom this condition has been found have been otherwise well formed, without vaginal atresia, double clitoris, or other evidence of epispadias. In the only two cases of adults where the cause was stated the prolapse occurred suddenly, once in labor and once in the course of an acute cystitis.

Symptoms.—When the vesical wall is prolapsed for only a short distance into the urethra, but not so as to appear at the meatus, it is said to cause symptoms like those of calculus; such a condition might perhaps be recognized with the aid of a sound if its possibility were borne in mind. Complete prolapse in adults gives rise to considerable abdominal pain and straining, but in children it is the presence of a tumor at the vulva which first calls attention to the condition. This is usually about the size of a walnut, and occasionally as large as an orange: it is somewhat pyriform in shape, and more or less pendulous, so that its base is directed toward the perineum. The tumor is sometimes soft, again tense and elastic, or even quite hard and unyielding; it is of bright-red or scarlet color, and its surface moist and slippery or occasionally granular and phosphatic, and not very tender to the touch. In children it will often be seen to enlarge and become of deeper color when the child cries or strains. On lifting the tumor so as to expose its under surface, the two orifices of the ureters may usually be found on careful search, and urine may be collected from either by the use of a small catheter. In some cases, but not invariably, the urethral ring surrounding the neck of the tumor may be seen, and a probe passed through it on either side of the tumor to the vesical orifice. The prolapse is almost invariably reducible, and usually the tumor slips back easily through the urethra without requiring any prolonged manipulation. If the prolapse is of long standing, the constant escape of urine and its contact with the skin of the vulva and thighs result in an inflammation of these parts; they may become eroded, or even ulcerated and coated with phosphatic deposit, as in cases of vesico-vaginal fistula.

Diagnosis.—Inversion of the bladder must be distinguished from urethral prolapse and from urethral or vesical polypus. Urethral prolapse is rarely if ever so large as the tumor found in cases of inversion; it has no pedicle, and its surface must of necessity be continuous in part with that of the vestibulum. A urethral polyp is irreducible, of slow growth, rarely so large as to conceal the meatus, is not kept moist by the constant trickling of urine, and its attachment to the urethral wall can usually be demonstrated with a probe. A prolapsed vesical polyp would present much the same appearance as an inverted bladder, and could likewise be pushed back through the vesical orifice; but once within the bladder the diagnosis would be clear, since the polyp could still be felt as an outgrowth from the vesical wall.

Treatment.—The first indication is to replace the prolapsed blad-

der. For this purpose the fingers should be well oiled, and reduction attempted by means of taxis, as in intestinal hernia. This is not usually difficult, but in some cases it may be necessary to push back the prolapsed portion on the end of a large sound; still, this is done at the risk of more or less injury to the part, and may generally be avoided. After reposition the recumbent posture must be kept for several days, and in children a pad and T-bandage may be applied to prevent the possibility of relapse. Meanwhile, the constipation or other source of violent straining must receive appropriate treatment. After reposition the urethral canal is found much dilated, admitting, even in children, the little and sometimes the middle finger. Incontinence is therefore to be anticipated in a certain proportion of cases, and if permanent the dilatation must be treated in the usual way, without, however, much prospect of cure.

§ 2. DISTURBANCES OF NUTRITION.

1. Hyperæmia.

An active congestion of the whole vesical mucosa does undoubtedly occur at times, and give rise to a passing irritability of the bladder, which may soon disappear of itself or be the precursor of vesical catarrh. Such congestion is often met with in the cadaver—not, however, as a diffuse redness, such as probably exists *intra vitam*, but as an injection of the individual vessels. Passive hyperæmia also may accompany affections of the heart or other disturbances of the general circulation, and often results in capillary hemorrhages and the formation of numerous punctate ecchymoses in the vesical mucosa. In the absence, however, of any well-marked clinical features which distinguish the various degrees of hyperæmia from the reflex disturbance known as irritable bladder, attention is called only to that peculiar form of chronic passive hyperæmia which is confined to the vesical neck, or, more strictly speaking, to the vesico-urethral junction.[1]

This rather uncommon affection is found chiefly in women of neurotic type, and more especially in connection with the group of symptoms which goes under the name of spinal irritation. Habitual constipation, prolonged retention of urine, vesical tenesmus, frequent coitus, and inflammation of the bladder and urethra, are the conditions which seem at least to favor its development. It is perhaps occasionally acute, but all the cases thus far observed have been chronic, and only this form will be described.

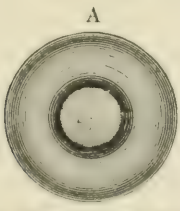
Symptoms.—The most prominent symptoms on the part of the urin-

[1] *Vide* Author's pamphlet: "Hyperæmia of the Vesico-urethral Membrane." *Gynecological Trans.*, vol. vii., 1883.

ary organs are very urgent and frequent micturition, attended by painful tenesmus of the vesical detrusor and sphincter. The bladder must be emptied every half hour, or even oftener, both day and night: the calls to micturate are so imperative that either a urinal must be worn or the patient must remain where an opportunity for relief is always available. The clonic spasm of the sphincter renders micturition extremely painful at times, and the stream is jerky and interrupted. The general health becomes of necessity greatly impaired, owing to the confinement of the patient within-doors, the constant pain, and the loss of sleep; and the nervous system, already more or less abnormally sensitive, becomes eventually a complete wreck. The urine usually remains clear, but may sometimes undergo great fluctuations in density, and contain oxalates or an excess of phosphates, as is common with hysterical individuals.[1]

These symptoms bear a great resemblance to those of cystitis and of fissure of the vesical neck. The former may in most cases be excluded by a urinary analysis, but from fissure this condition of hyperæmia can only be distinguished by means of the endoscope. In both affections vaginal touch as well as the vesical sound discloses a marked hyperæsthesia at the seat of disease; the introduction of the latter causes the most intense pain when the vesical orifice is reached, and the instrument is grasped by the irritable sphincter with a force which only patient waiting will overcome without serious injury to the tissues. For the same reason the endoscope can only be used when the patient is under ether. The picture which this instrument affords is that of a few tortuous veins upon an otherwise healthy membrane: this appearance is well shown by the accompanying cut, of which A represents

FIG. 149.



Healthy Vesico-urethral Membrane.

Hyperæmia of the Vesico-urethral Membrane.

the uniform rose-red tint of the normal mucosa, and B the condition of hyperæmia. The views are taken just at the moment when the rounded end of the endoscope is entering the bladder, the disk in the centre representing a portion of the vesical summit, which, the bladder being empty, falls against the end of the instrument. The condition is thus seen to be quite distinct both from the much more pronounced and

[1] Ultzman: "Ueber Pyurie (Eiterharnen) und ihre Behandlung," *Wiener klinik*, 1883, ix. 1–16.

swollen veins of varix and from the more uniform hyperæmia and thickening of a local inflammation. That the vessels seen are venous is probable from the constant absence of pulsation. It is evident that nothing but ocular inspection can distinguish this condition from fissure in the same locality, and the diagnosis is all the more important because of the absolute variance in the treatment of these two affections.

If the case be of recent origin, palliative treatment may be tried in the form of rest in bed, mild cathartics, diluent drinks, hot vaginal douches or sitz-baths, and opium suppositories or injections of chloral hydrate. As a rule, however, opium is to be used with great reluctance: there is the same danger of the opium habit as in cases of cystitis, and the slight rest thus afforded to the vesical neck has proved of no curative influence whatever in the cases of this affection thus far observed. When the hyperæmia is chronic, there is only one mode of treatment which has proved effectual, and that is the formation of an artificial vesico-vaginal fistula—the only method of procuring complete rest for the vesical orifice. A description of this operation and the subsequent management of the fistula will be found under the Treatment of Cystitis. After the fistula has been made the hyperæmia should receive direct treatment in the form of daily douches of hot water at a temperature of 105°–110° Fahr.; these may be conveniently given by means of a fountain syringe with a short nozzle, which enters the urethra only as far as the vesical sphincter, through which the stream will easily force its way. As in cystitis, it is all-important that the patient should be able to go about in the open air, and this may be made possible by a well-fitting urinal. The general health then becomes gradually restored, the nervous system regains its former tone, and then, but not before, the fistula may be closed in the usual manner.

2. Cystitis.

Inflammatory conditions of the bladder may be variously classified as acute and chronic, according to their duration; as local and general, according to the extent of surface involved; as catarrhal and parenchymatous, according as the process is limited to the mucosa or extends into the deeper layers; as muco-purulent, purulent, and gangrenous, with respect to the character of the secretion; and, finally, two special forms are called croupous or diphtheritic, according to the character of the false membrane which is their distinctive anatomical feature.

It is found most convenient from a clinical standpoint to consider these different forms together, since they are more or less associated in each individual case of cystitis, and have, generally speaking, a common etiology.

Pathological Anatomy.[1]—In acute catarrh the mucous membrane is reddened, swollen, and usually bathed in pus; there may also be signs of recent hemorrhage. After the inflammation has become chronic the alterations are more varied. The ingestion may still be general, but often it is confined to certain spots. The mucosa may be uniformly thickened or the hypertrophy may take the form of multiple polypoid growths. The color of the membrane may be brown or even black, or variously spotted as a result of numerous ecchymoses which have undergone subsequent pigment metamorphosis. Erosions, and even deep ragged ulcerations, are not infrequent. Especially noticeable is in most cases the extreme thickness of the vesical wall, which is partly inflammatory, partly a true muscular hypertrophy as a result of the long-continued over-action of the bladder. When, however, the cystitis has followed vesical paralysis, the walls are found quite thin.

In the phlegmonous or parenchymatous form of cystitis the vesical wall is stiffened and infiltrated with inflammatory products. There may have been suppuration and formation of an abscess, which may have opened either into the vesical interior, and thus formed a deep ragged ulcer with undermined edges, or the pus may have penetrated into the cellular tissue about the bladder, and eventually pointed in the vagina or broken into the adherent intestine, or even into the peritoneal cavity. Such events are, however, of very rare occurrence, and almost entirely confined to the diphtheritic variety. A simple adhesive inflammation of the vesical serosa—a pericystitis—is not so uncommon.

The croupous and diphtheritic forms are characterized anatomically by the formation of a false membrane, which in the former simply lies upon the vesical mucosa, while in the diphtheritic variety the membrane consists of the infiltrated and necrotic tissues themselves. These forms begin as localized hemorrhagic patches in the region of the trigonum which soon become covered with gray or grayish-black membrane. Those membranes may become wholly or partially loosened, so as to leave behind several small ulcerations, or they may increase in size and become confluent until the whole vesical surface is covered with an unbroken membrane which may later be exfoliated in the form of a more or less complete cast of the vesical interior. Such casts may be as large as a child's head: they represent in some cases simply the vesical mucosa; in others a good part of the muscularis is likewise exfoliated; and two cases are reported in which even the peritoneal coat was involved in the necrotic process, and a portion of this membrane was found adherent to the cast: this must have resulted from a partial inversion or pitting-in of the whole thickness of the vesical summit, with formation of adhesions at the neck of the pouch thus formed, and subsequent sloughing of the inverted portion. Croupous as well as

[1] Ziegler: *Virsch-Hirschfeld.*

diphtheritic inflammation may result in the formation of a vesical cast, but here the wall of the bladder remains intact, or loses at most its epithelial layer. The interior of any cast may feel as if covered with sand, owing to a deposit of urates; the same may also occur upon any erosion or ulceration of the vesical wall. The exterior of the bladder in these cases of croupous and diphtheritic cystitis is often found covered with a purulent or highly offensive exudation.

As a form of ulceration now and then found in the bladder, and having no connection with those already described, is to be mentioned the perforating ulcer first noticed by Rokitansky. It is quite similar in its pathological appearance to ulcus rotundum of the stomach.

Etiology.—Certain conditions both local and general exercise a marked predisposing influence upon the development of cystitis, and prominent among these is the puerperal state. At the beginning of pregnancy the vessels of the growing uterus become greatly enlarged; and this can hardly take place without a partial increase also in the blood-supply of the vesical neck. Then, again, after delivery the sudden collapse of the emptied uterus must evidently cause a temporary collateral hyperæmia of the bladder as well as other pelvic organs. These two periods, the first month or two of pregnancy and the first week following labor, are, in fact, not infrequently attended by cystitis, which now and then is of apparently spontaneous development.[1] Other predisposing conditions are menstruation and the menopause; it is by no means rare to find that micturition is somewhat more frequent during menstruation—a fact which would seem to indicate a slight congestion of the bladder at these periods. The scrofulous diathesis probably favors the development of vesical as well as other forms of catarrh.

Among the various exciting causes of cystitis, the influence of mechanical irritation of the vesical wall is at once apparent. Such an irritation may proceed from within or from without the body, or it may originate within the bladder itself. Of those coming from within, some are brought by the urine in the form of gravel, or as an excess of urates such as occurs in lithiasis, or as pus from the kidney. Perforation of the bladder may give entrance to fecal matter and intestinal gases, to the contents of a suppurating cyst, an extra-uterine fœtal sac, or a parametritic abscess. From without the body irritation may come in the shape of foreign substances, such as are often introduced by hysterical women, or from instruments inserted into the bladder for catheterization or operative purposes; also as direct trauma from falls or blows upon the bladder, or from violent coitus, or operative procedures in the vagina, and, especially during labor, from the long-continued pressure of the advancing head. The causes which originate within the bladder itself

[1] Monod: "Cystitis chez la Femme, etc.," *Ann. de Gynéc.*, 1880, 13, p. 167.

are vesical calculi and neoplasms, with both of which sooner or later catarrh is pretty sure to develop.

Chemical irritation may be a cause of cystitis; the form which sometimes follows the external use of cantharides is well known. Certain ethereal oils, tars, and balsams, such as turpentine and the balsams of copaiba and tolu, sometimes produce, when taken internally, the same irritating effect. Sour wines and young beer seem in some cases to exert at least a favoring influence upon the development of acute vesical catarrh. Again, chemical irritants may be introduced through the urethra for purposes of urethral or vesical medication or by mistake: Thomas has seen, for instance, a catarrh follow an intravesical injection of a 2 per cent. carbolic solution which was supposed by the nurse who gave it to have entered the vagina.

Vesical catarrh may furthermore result from the direct extension of affections of the neighboring organs. Frequent reference has already been made to the occasional implication of the bladder in certain diseases of the urethra. Periuterine cellulitis may involve the cellular tissue about the bladder, and eventually penetrate the vesical wall. Certain constitutional affections—notably, the exanthemata, puerperal fever, typhus, and cholera, occasionally also dysentery and typhoid—may be complicated by a cystitis which represents simply a local manifestation of the constitutional disease.

All the sources of cystitis hitherto mentioned are to be regarded as exceptional and of inferior importance as compared with two others which still remain to be considered—viz. the ammoniacal fermentation of retained urine and infection with unclean catheters. The exact relation of the alkaline fermentation to cystitis and to the introduction into the bladder of infectious germs still remains unascertained. While some contend that fermentation is impossible without bacteria, and that the cystitis is merely the result of the chemical irritant set free by the decomposition of urea, others regard the fermentation as a process which simply puts the vesical wall into a condition favorable to bacterial invasion. At all events, it is certain that these three factors, retention, catheterization, and fermentation, precede a large proportion of those cases of vesical inflammation which arise in connection with the puerperal condition, and, more especially, with retroversion of the gravid uterus and the ischuria which follows delivery. These latter are the cases most apt to take on a gangrenous or diphtheritic character, and which have occasionally been followed by exfoliation of the whole vesical mucosa. It is not, however, to be understood that the mere act of catheterization is held responsible for these unfortunate cases; on the contrary, evacuation of the bladder is usually too long delayed, and when, at last, the bladder is artificially emptied, the fault lies not in the catheterization itself, but in the imperfect method which is usually adopted.

The use of dirty instruments, the lack of all precaution in regard to the entrance of air into the bladder, and the carrying in upon the catheter of lochial discharge, have undoubtedly in many cases furnished the already susceptible vesical interior with infectious germs. The same forms of acute cystitis may also follow complete retention from sources other than those connected with the puerperium. Such are the various forms of urethral obstruction from calculi, stricture, and the like; vesical paralysis from whatever cause; the retention of hysteria; and, in some cases, voluntary retention because of painful micturition.

Besides the cases of acute retention and subsequent acute cystitis, there are others where retention is only partial and the onset of cystitis is more insidious. This may occur when the obstruction from a stricture or neoplasm is incomplete and with vesical paralysis of gradual development; sometimes also with cystocele or other forms of diverticulum, and in consequence of the gradual thickening around the vesical orifice which follows long-continued vesical tenesmus. Here, again, ammoniacal fermentation and the improper use of the catheter play an important rôle; and whenever the former has taken place cystitis is not slow to develop. Sometimes this occurs without catheterization; and it would certainly appear that instrumentation is not the only means of access to the bladder which these micro-organisms possess: it will, however, always remain the most ready mode of entrance, and the one to be most carefully guarded by antiseptic precautions.

Nothing has as yet been said about the influence of cold upon the development of vesical catarrh; and this because it is probably of much less importance than it commonly seems. Considering the sheltered position of the bladder, and the comparative immunity of children from cystitis at an age which is otherwise eminently predisposed to catarrhal affections, it would seem very surprising if in the adult this condition of things should be completely reversed. At the same time, it is to be remembered that after puberty the blood-supply of the bladder is subject to much greater variation than in children, and that during labor the vesico-vaginal septum is at times directly exposed to atmospheric influences. Cold may therefore be now and then an exciting cause of vesical catarrh in adults, but it should never be accepted as the prime factor until every other possible source has been carefully considered.

Symptoms.—The simplest form of acute catarrh, such as results from cantharides or trauma or irritating injections, comes on suddenly with increased frequency of micturition, more or less severe pain attending the act, and a sensation of weight and discomfort behind the pubes. There is always considerable tenesmus, but this varies in degree according to the extent to which the vesical neck is implicated. The urine has a normal specific gravity, is slightly acid or neutral, only moderately

clouded, and the sediment contains a somewhat increased quantity of leucocytes, without crystals of triple phosphate.

More commonly acute cystitis has a purulent character from the outset, but even then, in the majority of cases, the general disturbance is very slight. The hypogastrium is quite tender on pressure, and is the seat of considerable pain, which radiates into the loins and down the thighs. In many cases that follow labor where bacterial invasion may be presumed a severe rigor ushers in the attack, and the evening temperature may for several days reach a considerable height. A peculiarity of these cases is that in the morning the temperature is often normal, and the patient bright and hungry until evening, when the same rise to 103° or 104° occurs as on the day before.[1] As a rule, the lochia are inoffensive, and, except the cystitis, there is no sign of puerperal infection. The urine is pale yellow, or sometimes red from the presence of blood; it is of a highly ammoniacal odor, of alkaline reaction, and albuminous in proportion to the amount of pus. The sediment is very abundant, and consists almost wholly of pus, triple phosphate crystals, and bacteria, with some red blood-corpuscles and bladder epithelium.

The most severe and fatal forms of acute cystitis are those which have been anatomically described as the croupous and diphtheritic. We have already seen that these forms may occur as a local expression of other grave infectious diseases, or may be of purely local origin, as a consequence of long retention or the introduction of specific germs from without. If following labor, the disease usually comes on immediately in the course of the first three or four days after delivery. It begins most often with a rigor, and this may be repeated at frequent intervals throughout the course of the cystitis. The fever runs high, the tongue becomes dry and glazed, and the whole condition of the patient is such as to indicate a grave affection. The urine is voided with great difficulty and pain, or the vesical orifice may be so blocked by membrane or shreds of tissue as to render micturition impossible. On the other hand, there may be incontinence if the bladder has been paralyzed by long distension or the urethra has become partially dilated by a membranous plug which has subsequently escaped. The hypogastrium is exceedingly tender, and the external genitals are sometimes covered with a fibrinous deposit. Catheterization may fail to empty the bladder even when the latter is evidently much distended and when frequent withdrawal of the instrument and inspections of its orifice make it evident that no plugging has occurred: this symptom has been noted in those rare cases where exfoliation of the whole vesical mucosa has resulted in the formation of a sac filled with urine—a second bladder within the first—which the catheter does not reach. The most marked characteristics of these forms of cystitis are to be found in the urine. The latter

[1] Richardson.

is thick and turbid, of a dirty-red or brownish color, and with an indescribably offensive odor which is said by Ultzman to remind at the same time of decaying flesh, sulphuretted hydrogen, and feces: this odor, however, is not peculiar to diphtheritic cystitis, but is found with any urine which comes from an ulcerated or gangrenous bladder. The sediment consists of countless bacteria, triple phosphates, and cellular detritus, the individual pus-, blood-, and epithelial cells having entirely disappeared under the influence of the alkaline fermentation. Shreds of false membrane and tags of necrotic tissue are often encountered, and occasionally large pieces of membrane, or even a complete cast of the whole vesical interior, may escape through the urethral canal: this is an event which occurs, if at all, in the third or fourth week of the disease, and is usually followed by a rapid amelioration of the patient's condition.

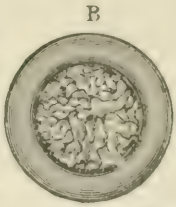
We are now brought to the symptomatology of chronic cystitis, an affection which surpasses almost any other in the amount of pain and misery which it may cause. It may be the outcome of an acute catarrh, but more often comes on insidiously in consequence of some long-continued source of vesical irritation. Frequent and painful micturition, followed by tenesmus, is the most prominent symptom. The patient is often obliged to sit almost constantly upon the vessel, or else wear some form of urinal which permits micturition at very frequent intervals. Only a few drops of urine collect in the bladder before the sense of painful distension and the desire to urinate become irresistible, and a teaspoonful perhaps of urine is then forced out, sometimes with the greatest difficulty owing to painful spasm of the vesical sphincter, and always with more or less suffering. At night, in the recumbent posture, there is little if any amelioration of the distress, and eventually loss of sleep and constant pain and worry begin to tell upon the general health. The appetite is lost, the patient becomes emaciated, and her features look worn and express great suffering. Finally, if no relief is afforded, the inevitable result is secondary disease of the kidneys and uræmia. This is, however, the work of years: it is astonishing how some women keep about year after year without yielding to their complaint and in the daily performance of their household duties.

The local examination in a case of chronic cystitis generally reveals a thickened and contracted bladder, which may often be felt through the vesico-vaginal septum as a hard, resistant tumor. The introduction of the sound causes great pain at the vesical neck, and sometimes hemorrhage; it is often grasped so tightly by the vesical sphincter that its withdrawal must be postponed until the muscles have partially relaxed. The depth of the bladder is found to be but 6–12 cm., instead of the normal 15 cm.; but for this purpose the sound must be gently used, in view of possible ulcerations which the instrument

might easily penetrate. The endoscope reveals a thick network of congested vessels in the vesical mucosa, instead of the pale rose tint of the normal membrane; possibly also polypoid hypertrophy or ulceration.

FIG. 150.

Healthy Bladder: membrane seen through the dilated urethra.



Chronic Cystitis: seen through the dilated urethra.

The urine varies considerably in different cases of chronic cystitis. When there is ulceration the urine may have the greenish-brown color and fetid odor which it has in diphtheritis. More often it is pale and of slightly acid, neutral, or highly ammoniacal reaction, according as it escapes frequently or is retained for some little time in the bladder. When ammoniacal it is more or less ropy from the well-known action of ammonia upon pus. Albumen is found in proportion to the amount of pus, and the latter, with epithelial cells, triple phosphates, and bacteria, forms an abundant sediment which is usually white, but not infrequently red or brown from the presence of blood.

DIAGNOSIS.—The careful examination of the pelvic organs, which the vesical symptoms will naturally lead to, will aid in establishing the cause of the cystitis rather than its presence. It is always of especial importance to know whether this may not be a calculus or new growth; hence the necessity for the careful use of the sound. The urethra, rectum, and uterus must also be closely interrogated, for we have already seen how often these organs furnish the source of vesical irritation. The urine, however, is the factor which has the greatest diagnostic value. There can be no catarrh without catarrhal secretion; hence a clear urine effectually disposes of the possibility of cystitis. If the urine is cloudy and contains pus or an excess of mucus, we must decide from which part of the urinary tract these come. Urethritis can hardly be mistaken for cystitis unless ocular inspection of the urethra be neglected: however, with cystitis pus never escapes from the meatus except at micturition, and the urine which is passed toward the close of micturition is more cloudy than that which first escapes. The chief features which distinguish a renal from a vesical affection are—the larger amount of albumen than can be accounted for by the amount of pus and blood; the presence of casts of the renal tubules; the absence of pain at micturition; and no greater frequency of the latter than can be accounted for by the quantity of urine secreted. When only the pelvis

of the kidney is diseased, the diagnosis is sometimes more difficult. The urine may be filled with pus and the bladder be quite irritable, but there will usually be a history of renal colic and of acute pain in the region of the affected kidney: the urine generally contains some casts, and sometimes a sufficiently large amount of pelvic epithelium to be of great assistance in diagnosis.

Croupous or diphtheric inflammation may be suspected if in a case of cystitis following long retention of urine or childbirth frequent rigors and hectic fever give evidence of a septic process, while the urine rapidly assumes a fetid character. If, in addition, portions of false membrane or tags of necrotic tissue are passed, the diagnosis becomes quite certain. Phlegmonous inflammation of the vesical wall, with formation of pus in the cellular tissue about the bladder, can only be recognized by the appearance of local œdema, tenderness, or fluctuation in the vesico-vaginal septum or behind the pubes.

Prognosis.—A simple catarrhal cystitis of acute origin generally disappears in the course of ten to fourteen days, this more especially in those forms which follow mechanical or chemical irritation. In general, the duration will depend upon that of the exciting cause. Occurring in the course of pregnancy, the tendency of cystitis is to persist until the former is terminated; in some cases abortion is a direct result of the cystitis, and may cause its speedy cessation. Chronic cystitis of long standing is an exceedingly intractable disease. Even if there is no evidence of renal complication, no assurance of complete recovery should be given at the outset; indeed, interstitial changes in the vesical wall often preclude all possibility of the organ regaining its normal capacity and expulsive power. All forms of croupous, diphtheritic, and gangrenous inflammation of the bladder demand an exceedingly grave prognosis; of nine cases collected by the author, three were fatal, but the mortality is probably much higher than this limited number of cases would indicate.

Treatment.—If the etiology of cystitis be borne in mind, the importance of prophylaxis will at once appear. Proper pessaries for uterine, vaginal, and urethral dislocations, recognition and treatment of fissures, hemorrhoids, lithiasis, and, in general, any form of reflex vesical irritation, are among the more common means by which it may be hoped to forestall the development of cystitis. Still more important is timely relief in all cases of retention, and the method by which this is accomplished. Dirty catheters have always been one of the most fertile sources of cystitis, and any catheter made in the usual way, with a window at some distance from the tip, cannot be kept clean: a residue of filth will always remain in the blind end of the instrument which no amount of antiseptic soaking or scrubbing will reach. Of course these means of cleanliness must be relied upon in many cases,

and it is hardly necessary to say that every catheter should be thoroughly washed, both internally and externally, in one of the antiseptic solutions before and after use. But in all cases where it is possible the patient should be provided with a new catheter; and Küstner[1] has practically demonstrated the possibility of doing this in nearly every case which demands catheterization. This surgeon has adopted the use of a catheter which consists simply of a straight piece of common glass tubing open and carefully smoothed at both ends. Thus every patient can be provided with a new and inexpensive catheter, which has the additional advantage of being easily and thoroughly cleansed; and since this practice has been introduced into the lying-in hospital at Jena hardly a case of septic cystitis has occurred. Almost equally good results have been attained at Halle by the use of an ordinary catheter which is attached to a fountain syringe, so that a stream of an antiseptic solution is made to flow through it during its introduction, and the entrance of air into the bladder thus avoided. A combination of these two methods is eminently practicable, and deserves to be generally adopted, especially in all cases where there has been long retention of urine and possibly ammoniacal fermentation. Moreover, the vestibulum should be carefully washed previous to catheterization in all cases where there is any possibility of septic infection, and the instrument should be introduced with the meatus exposed to view. When it is necessary to use a soft-rubber catheter, it should open at the end instead of by the usual eye; such a catheter can be more easily cleaned, and there is less danger of prolapse of the vesical membrane into the opening, and its subsequent strangulation and injury upon withdrawal of the instrument.

A case of acute aseptic vesical catarrh should receive at the outset only constitutional treatment. The patient should keep the recumbent posture—the diet should be bland and unstimulating, consisting chiefly of milk, and meats of all kinds be avoided. The bowels should be kept open by saline cathartics, and even a slight over-action is desirable as a mild form of counter-irritation. Hot sitz-baths several times a day give great relief from the vesical pain and tenesmus; and these symptoms are also to be relieved, if necessary, by some form of opium, preferably suppositories, or by chloral hydrate in the form of an enema, beginning with gr. xx in ℥ij of starch-water, and repeating this, if necessary, three or four times daily. In appropriate cases a few leeches may be applied to the vesico-vaginal septum. Finally, the urine must be kept as dilute and as nearly neutral as possible, in order that it may be unirritating to the bladder. This is effected in part by an exclusive milk diet, in addition to which ℥j of infus. buchu, and, if the urine is acid, gr. xv of citrate of potassium, should be given every six hours.

[1] *Deutsche med. Woch.*, 1882, p. 293.

If the urine is alkaline, benzoate of ammonia should be substituted for the potash, beginning with gr. x every two hours, and increasing this dose, if necessary, until a neutral or slightly acid urine is obtained. The author considers the benzoate of ammonium a remedy of the greatest value in cystitis, and believes that by its timely use in the beginning of the affection the latter may often be cut short if not completely aborted. When a milk diet cannot be adhered to, the patient should drink large quantities of flaxseed tea, which may be made into the more palatable form of lemonade.

In cases which under this treatment do not speedily improve, and in all cases at the very outset when the cystitis is of septic character, the bladder must be washed out at frequent intervals. Any good apparatus for this purpose must comply with the following requirements: It must cause the least possible pain; it must be capable of thorough cleansing; the stream must not be too strong or jerky; no air must be permitted to enter the bladder; there must be means of exit for the injected fluid, together with portions of blood-clots or bits of tissue, such as are often present in diphtheritic and chronic cases; finally, the amount injected must be easily regulated, and it must be sufficient to reach all portions of the vesical cavity. Matters of convenience should be made entirely subordinate to those of cleanliness and antisepsis; hence stopcocks and double catheters, which are difficult to clean, should be avoided: moreover, with a double catheter the bladder is not thoroughly washed, as may be easily demonstrated by a subsequent washing with a single catheter and an ordinary hand-syringe. The following plan is recommended as being both simple and effectual: A straight glass tube, the size of a No. 20 French sound, open and carefully smoothed at both ends, is used for a catheter. Küstner has them made with the outer end slightly flaring, and ground upon the inside so as to receive and perfectly fit the ground-glass nozzle of the syringe: this is, however, quite unnecessary, since connection with the syringe can be quite as easily effected by means of a small piece of rubber tubing, which slips over the end of the catheter and receives into its other end the tapering glass nozzle of the syringe, such as can be readily extemporized from a small piece of glass tubing. Such an apparatus presents no corners for the collection of filth; it can be taken quite apart and be as thoroughly cleansed as is possible for any combination of tubes. A fountain syringe is the best form for ordinary use, since its flow is even and the force easily regulated.

To wash out the bladder the patient is placed upon the back over an ordinary bedpan. The catheter is then inserted while the stream is flowing, in order to prevent the possible admission of air. As soon as the catheter is in the bladder the nozzle of the syringe is removed and the urine allowed to flow until the bladder is nearly empty, when

the end of the rubber tubing must be tightly pinched between the fingers until the nozzle, with the stream turned on, is again inserted; or, still better, the free end of the tubing may be kept constantly under water, and thus the entrance of air during insertion and removal of the nozzle be made absolutely impossible. The amount to be injected at each time must depend upon the capacity of the individual bladder. The stream may in general be allowed to flow until a slight uneasiness in the bladder is felt by the patient: this rule is, however, subject to some limitation, since it is evident that in certain paralytic conditions this plan would only serve to further distend an already weakened bladder. According to Sir H. Thompson, not more than 60 gm. should ever be injected at once, while Ultzman uses 200 gm., and Winckel still larger quantities. Great judgment will be necessary in each individual case. Each washing, which should be repeated two to four times daily, is to be prolonged until the liquid comes away quite clear.

The injection may be astringent, antiseptic, or a simple dosage. In acute, and often in chronic, cases we wish simply to cleanse the bladder of irritating secretion, and for this purpose warm water to which has been added a small quantity of common salt, about 5j to the pint, is often sufficient; or a 3 to 5 per cent. solution of chlorate of soda or borax may be used when the secretion is particularly tenacious. We may also use antiseptics even in these simple forms on grounds of prophylaxis—either a 1 : 5000 solution of corrosive sublimate or a 10 to 20 per cent. solution of carbolic acid. Somewhat later, when the pain and tenesmus have subsided, it may be necessary to use astringents. Those most commonly employed are nitrate of silver of a strength of 0.1 per cent., gradually increased up to 0.5 per cent., a 0.5 to 1.0 per cent. solution of tannin, or a 0.1 to 0.3 per cent. solution of permanganate of potash. Before using the astringent the bladder should first be washed with warm water until free from secretion, and then 100 gm. of the medicated solution should be injected and allowed to remain for a few moments.

In septic cases attended with fever and a foul urine an energetic antiseptic treatment must be carried out from the very beginning. The chief indication, in addition to general symptomatic treatment, is to disinfect and thoroughly drain the bladder. In the worst cases it should be washed out with an antiseptic solution every one to three hours; and Fritsch[1] has been very successful in the constant drainage of the bladder through a piece of rubber tubing, which can be easily inserted through the urethra by gentle rotation until just barely inside the bladder, and then fastened, if necessary, by a stitch at the meatus: through this tube the bladder is allowed to drain, and is also irrigated

[1] *Frauenkrankheiten*, Braunschweig, 1881.

with a carbolic or sublimate solution every two hours. If, in spite of washing and drainage, the temperature in such a case continues high, the urine foul, and small pieces of false membrane appear, the urethra should be dilated in search of a more extensive exfoliation of the vesical mucous membrane. It may not be necessary to dilate to the full extent, since a portion of the membrane will sometimes protrude into one of the smaller specula so as to permit extraction with the forceps. If not, digital exploration should be made in the hope of emptying the bladder and of the improvement which has usually followed this event. Phlegmonous cystitis with formation of abscess must receive also the same local treatment as other forms of pelvic cellulitis.

Chronic cystitis is the form which will most tax the patience and skill of the physician. The constitutional treatment of chronic cystitis is quite the reverse of that which is to be pursued in the acute stage. The diet must be more strengthening, although, in general, wines, spices, and stimulating foods are still to be avoided. The patient should go out of doors and have plenty of fresh air and moderate exercise: a course of treatment which confines her to her bed for any length of time is to be unequivocally condemned. Opium should be rarely used; in no disease is the opium habit more easily formed than in chronic cystitis. Bromide of potassium in 30-grain doses repeated every four hours will sometimes relieve tenesmus, and in paraldehyde we possess a valuable drug for constant use in insomnia. The bowels must be kept free by Hunyadi water, citrate of magnesia, or other mild aperient. Digestion must be aided if need be, and iron, cod-liver oil, and other tonics will often prove valuable adjuvants in the treatment of this affection. In short, the general health must be improved and the patient must have sleep, good food, and fresh air—matters which are apt to be forgotten in the severity of local symptoms.

Nevertheless, local instrumental treatment of the bladder itself must form the main feature of any successful line of treatment. In some cases washing and astringent injections will prove sufficient: this method should first be tried in all the more recent and milder cases, but it is not to be long continued if it prove unavailing. The way in which this washing should be done has already been described. In general, somewhat stronger injections may be used than in the acute form, and if there is no sign of ulceration they may be thrown in with somewhat greater force: when a stream is simply siphoned into the bladder and out again through a double catheter, a large portion of the contracted vesical wall remains unwashed, and the desired end is not attained; on the other hand, too forcible distension of an ulcerated bladder may cause rupture: both these extremes must be avoided if the washing is to be effectual. The washing should be done twice a

day through a glass tube, or, if this be too painful for the vesical neck, a soft rubber catheter open at the end or a piece of ordinary soft-rubber tubing may be substituted. A weak antiseptic solution (carbolic acid 1 : 500, corrosive sublimate 1 : 5000) may be used at the outset, or one of the various astringents: all fluids should of course be injected warm.

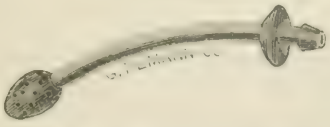
If these mild injections fail, a stronger solution of nitrate of silver should be tried, which in many cases has proved very effectual. After thorough washing of the bladder, gm. 30 of a 3 to 5 per cent. solution should be injected and retained for a few seconds; and this application should, if necessary, be repeated in a week. The pain following the injection will usually be severe and require an opiate.

Dilatation of the urethra has been often recommended for chronic cystitis, and, though it can have no curative effect, the stretching of the vesical neck does undoubtedly relieve for a time the painful tenesmus and give the bladder longer periods of rest. If used for this purpose, it should fall short of the limits which may be safely observed in health, since under diseased conditions of the sphincter dilatation is much more apt to be followed by permanent incontinence.

Certain cases of chronic cystitis do not show any marked improvement under the treatment already described; and in such time should not be wasted in uncertain attempts with this or that drug which has been recommended for cystitis, while all this time, perhaps, the kidneys are becoming hopelessly diseased. For those cases the only prospect of relief lies in drainage of the vesical cavity, and thereby complete rest for the diseased organ. This may be effected by means of a catheter or by an artificial vesico-vaginal fistula.

1. *Self-retaining Catheters.*—The principal difficulty attending this method is the irritability of the vesical neck and its intolerance of any instrument. In some cases, however, this may be overcome, and it is worth while to make the attempt in the hope of avoiding the more serious alternative of vaginal cystotomy. Of the catheters specially devised for this purpose, that of Goodman is probably the best, except that it should be made a little more rounding at the tip, as shown in the figure; its curved shape and the enlargement at each end

FIG. 151.



Skene's Modification of Goodman's Self-retaining Catheter (Skene).

ensure its retention in the bladder. Instead of a catheter, a piece of rubber tubing eight to ten inches long may be used, one end of which

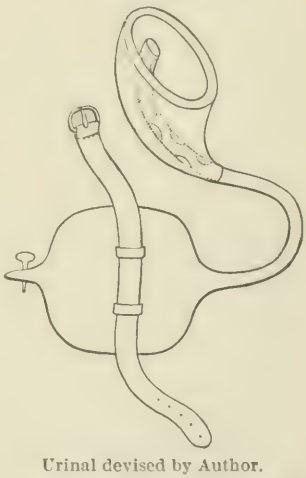
has several small openings like a drainage-tube, and lies coiled up within the bladder: the other end must be fastened to an abdominal band. Or a shorter piece of tubing may be passed just within the vesical orifice, and its other end stitched to the meatus, as advised by Fritsch. Either of these may be connected with a urinal which is worn strapped to the thigh. A catheter which is not borne at all at the first insertion will sometimes be retained for half an hour on the second, and so on, by the aid of opiates perhaps, until the bladder has become perfectly tolerant of its presence. Daily washing of the bladder must be continued through the catheter, which should also be removed every two or three days and thoroughly cleansed.

2. A far more practical and efficient method of draining the bladder, and one invariably adopted by the author as soon as the very mildest means of treatment have proved unavailing, is the formation of an artificial vesico-vaginal fistula. Emmet was the first to do this operation for the relief of chronic cystitis in the female, and its importance can hardly be over-estimated in dealing with intractable cases. Emmet advises that it be made as follows: The patient is etherized, placed in the Sims position, and the perineum well retracted; a sharply-curved sound is passed into the bladder, and its beak pressed against the septum, so as to protrude in the median line a short distance behind the vesical orifice: it is then cut down upon by the aid of tenaculum and scissors. The blunt blade of the latter is inserted through the opening into the bladder, and the incision prolonged 3 or 4 cm. in the direction of the cervix uteri. Care must be taken that the blade of the scissors really enters the bladder, since it is apt to penetrate the loose cellular tissue between the vesical and vaginal membranes, and thus the latter only is incised. The edges of the incision should then be cauterized, or the vesical and vaginal membranes united by a continuous catgut suture to prevent the fistula from closing; the same end may be furthered in a measure by instructing the patient to pass her finger into the opening every morning and night. Any troublesome hemorrhage at the time of operation may be at once arrested by passing a deep transverse ligature through the upper or lower angle of the incision, according to the direction from which the blood comes; any such measure will, however, be rarely demanded. Pallen[1] prefers to make the opening by means of the Paquelin cautery at a red heat, the tip being drawn slowly back and forth along the median line until the tissues are perforated; all hemorrhage is thus avoided and the permanent patency of the opening is assured. In whatever manner the fistula is made, the patient must keep in bed for a few days after the operation, and measures must be taken to collect the constantly-escaping urine. The edges of the fistula and the parts liable to urinary contact should be kept well

[1] *Am. Journ. Obst.*, xi. 269.

anointed with vaseline. As soon as any tendency to phosphatic deposit is noticed, the latter should be scraped away and the raw surface painted with a strong solution of nitrate of silver (20 to 60 per cent.). Twice daily the vagina and bladder should be thoroughly douched with warm water in the manner already described in speaking of hyperæmia of the vesical neck. Afterward some form of urinal is to be fitted, so that the patient can go about and have the benefit of fresh air and exercise. Skene's urinal is well adapted for some cases, the external soft-rubber urinal for others. Sometimes neither of these will answer, and trial can then be made of one which the author has devised, as figured in the accompanying cut. The upper or vaginal part consists of a cone of rubber sheeting with its base cemented to the circumference of an ordinary Meigs ring-pessary, while from the apex of the cone a rubber tube conducts the urine to a reservoir which is strapped to the thigh.

Fig. 152.



Urinal devised by Author.

The fistula must be kept open in most cases for months. No thought of closure is to be entertained until pus and blood have entirely disappeared from the urine and the vesical interior has ceased to be sensitive to touch. Moreover, the patient must have regained a fair amount of strength, in order that the necessary operation may be well borne and union of the denuded surfaces be assured. The fistula is then to be closed in the usual way.

In some cases of chronic cystitis, after all inflammatory action has disappeared, micturition, though painless, continues to be very frequent, because of a diminished capacity of the bladder. The best way to try and overcome this insufficiency is to instruct the patient to always hold her urine for some little time after the desire to empty the bladder is felt. If this method of stretching the organ does not succeed, enough water to cause moderate discomfort to the patient should be daily injected into the bladder and retained for a few moments. The amount used each day may thus be gradually increased until the capacity of the bladder has reached a pint, and this favorable result may in most cases be confidently anticipated.

3. Fissure of the Vesical Neck.

This lesion corresponds in every way to fissure of the anal sphincter. It occurs as a linear ulceration, 1 cm. or less in length, at the bottom

of one of the folds of the vesico-urethral junction. Its etiology is doubtful, but it probably originates in most cases in a small trauma, the injury being usually incurred during labor, artificial dilatation of the urethra, or the passage of a calculus. At other times it is observed to follow urethritis or cystitis, and begins perhaps as an abrasion which later becomes an ulcer in consequence of the excessive irritation at the vesical orifice which attends frequent micturition and tenesmus.

The SYMPTOMS of fissure are out of all proportion to the extent of the lesion, and proceed from the stretching of the sphincter at each act of micturition. The latter is attended with great pain at the vesical neck, and with a spasmodic contraction of the sphincter which makes the stream jerky and persists for some little time after the bladder is emptied. Micturition is also frequent in consequence of the irritation to which the vesical end of the fissure is constantly subjected by the urine. The painful tenesmus at the close of micturition may sometimes cause fresh laceration of the fissure and the escape of a few drops of blood from the meatus.

The DIAGNOSIS cannot be made by the rational signs with any degree of certainty, because of their great resemblance to the symptoms of cystitis and hyperæmia of the vesical neck. The urine must first be examined, of which all but the first few drops will be found clear. Vaginal touch will disclose a localized tenderness at the vesical neck. But the diagnosis must remain doubtful until by the aid of the endoscope the fissure is seen as a small grayish ulceration, with red, inflamed edges, at the vesical neck. Skene's endoscope is the best for this purpose, and the bladder should contain a small amount of fluid at the time of examination. Occasionally the fissure may be seen through one of Simon's specula, before the open end of which the folds of the canal close in as the instrument is slowly withdrawn. In some cases the introduction of the speculum makes the fissure bleed and gives it the appearance of a fresh tear. The use of any instrument is also extremely painful, and usually demands an anæsthetic.

The TREATMENT of fissure is, as a rule, completely successful, and the method which has thus far given the best results is artificial dilatation of the urethra. By stretching the sphincter, spasm is allayed, the urine can be detained for a longer time, and the fissure is given an opportunity to heal. Dilatation need not usually be carried beyond the fifth number of Simon's plugs. If this alone fails to cure, lapis mitigatus or the solid stick may be fused upon the end of a probe and applied directly to the fissure, the parts having been first thoroughly cleansed and care being taken to touch only the ulcerated surface. Or the base of the ulcer may be incised with a small knife which Skene has invented for this purpose. If then the symptoms still persist, the only thing which remains to be done is vaginal cystotomy in order to

drain the bladder through the fistula and give the sphincter complete rest. The cautery should not be used in this case, since the fissure will soon heal and a rapid closing of the fistula is desirable.

4. Hypertrophy and Atrophy of the Bladder.

(*a*) *Vesical hypertrophy* may occur under all circumstances where the organ is called upon to contract more frequently or more powerfully than under normal conditions. It is then purely compensatory, and as such is found with urethral obstruction, long-continued vesical tenesmus from reflex irritation, chronic cystitis, vesical tumors, and dislocations. It occasionally attends polyuria, as in cases of diabetes or interstitial nephritis. The hypertrophy may be either excentric or concentric, according as the vesical capacity is increased or diminished. The latter is more frequently found with cystitis and other affections where micturition is very frequent and the amount of urine small; while excentric hypertrophy occurs with obstruction and other conditions attended with moderate vesical dilatation. In either form the walls of the bladder are much thickened, chiefly from increase of muscular tissue. This increase may be evenly distributed throughout the whole organ, or it may be limited to the trabeculæ, which can often be felt with a sound, and between which the comparatively thin vesical wall may be dilated in the form of pouches or sacculæ: these may become so thinned as to consist of little else than a mucous and peritoneal coat, and they present favorable conditions for the stagnation of urine and the development of phosphatic calculi.

We have already seen that thickening of the vesical wall is not always a true muscular hypertrophy. Chronic cystitis is sometimes attended with a polypoid hypertrophy of the mucosa, or, again, with an interstitial hypertrophy which is purely inflammatory and greatly impairs the future usefulness of the organ.

Treatment.—Muscular hypertrophy will be rarely found without some complicating affection, of which it is itself merely a symptom, and against which treatment must be directed. Occasionally the hypertrophy may persist after the cause is removed, but it will then cause trouble only in so far as it affects the vesical capacity. If the latter is diminished, micturition will be too frequent—a condition of which the only means of relief has already been pointed out. If the vesical capacity is increased, this condition may be recognized by the use of the sound immediately after urine has been drawn, the depth of a normal bladder being only 15 cm. from the external meatus to the extreme summit. A dilated bladder favors partial retention of urine; it must therefore never be allowed to fill itself completely, and thus, if possible, be induced to resume its normal dimensions. If urine is retained after

each micturition, the catheter must be constantly employed by the patient herself.

(*b*) *Atrophy.*—It is only in connection with paralysis from over-distension of the bladder and from disease of the central nervous system that vesical atrophy is ever met with in the young. As a part of general senile atrophy all the vesical coats are often found very much thinned, and in some cases almost transparent. We shall again have occasion to speak of the various paralytic conditions in the section on Vesical Neuroses. If senile atrophy of the bladder prevents its being properly emptied, electricity should be applied by means of a vesical electrode and a faradic battery. If this fails, the urine must be frequently drawn with a catheter in order to secure complete evacuation of the bladder and prevent further distension.

5. Tuberculosis of the Bladder.

Vesical tuberculosis in the female is a very rare affection. When it does occur it is generally in connection with tuberculosis of the whole urinary tract, which begins usually in the kidney, possibly now and then in the urethra. It may also be secondary to general tuberculosis, and in very exceptional cases it is primary in the bladder itself.

The vesical interior may be simply sprinkled with miliary tubercles, or it may present at its base a few small superficial ulcerations with somewhat infiltrated edges, and showing nothing macroscopically which is characteristic of tubercle. In primary tuberculosis of the urinary organs there are more serious changes. At the base, and especially around the three orifices of the bladder, are numerous deep ulcerations with cheesy base and edges, often undermined and sometimes confluent, so that the whole or a greater part of the bladder seems to be covered with a thick cheesy layer. The parts not ulcerated are inflamed, hemorrhagic, and often sprinkled with miliary granulations.

The symptoms of this disease are precocious hemorrhage with polyuria, and subsequent development of a severe and intractable cystitis without apparent cause, and attended with unusual tenderness of the vesical base and neck. Hemorrhage may occur two or three years before there is any other symptom. Sometimes the origin of the trigonum, as felt through the vagina, is indurated and very sensitive to touch, while the vesical summit is soft and pressure behind the pubes quite painless.

The diagnosis is usually difficult unless tubercle bacilli are found in the urine. That they are usually present in the later stages is to be accepted as an established fact, but whether invariably, and how early in the disease, must be decided by further observation. Hemorrhage occurring early in an otherwise healthy woman from twenty to thirty-

five years of age, where vesical exploration fails to disclose either new growth or foreign body, should arouse a strong suspicion of tuberculosis. Moreover, the hemorrhage is quite different from that which accompanies calculus, being quite independent of physical exertion and often occurring in the night. If, later, chronic cystitis insidiously develops, with excessive tenesmus and a persistent blood-streaked urine, while the general health steadily deteriorates in spite of treatment, the diagnosis of tuberculosis is rendered quite certain. Often a physical examination of the lungs will reveal an incipient phthisis and materially strengthen the diagnosis.

The TREATMENT can only be palliative and symptomatic.

§ 3. VESICAL NEOPLASMS.

All vesical tumors, whether benign or malignant, have certain features in common. They all have a tendency to become pedunculated or polypoid, and hence the term "polypus" alone expresses nothing as to the histological character of the growth. The favorite seat of all vesical neoplasms is the neighborhood of the three vesical orifices, or, more generally speaking, the fundus. Any new growth acts as a foreign body, and eventually produces muscular hypertrophy and catarrh; phosphatic deposits are therefore frequent, either as calculi or as incrustations upon tumors or ulcerations. Any polypoid growth may make its way into or completely through the urethral canal, so as to appear externally at the meatus; this is not, however, of common occurrence. All varieties of vesical neoplasms may cause complete obstruction of one or both ureters and secondary degeneration of the kidneys.

Vesical tumors may be conveniently classified as follows:

1. Hyperplasia of the mucous membrane (mucous polypi);
2. Fibroma and fibro-myoma;
3. Papilloma;
4. Sarcoma;
5. Carcinoma.

1. *Hyperplasia of the mucosa* may be either local or general. Local hyperplasia occurs in the form of one or more mucous polypi, which are similar to those so often found in the uterus and rectum. They are soft, fleshy, pendulous growths, sometimes as large as a hen's egg, often glandular, and otherwise resembling in most respects the mucous membrane from which they grow. They are sometimes congenital.

General hyperplasia, also called polypoid hypertrophy, is nearly always a result of chronic cystitis. The mucous membrane may be uniformly thickened, or it may present numerous small elevations in the form of warty, fungous, polypoid, or cauliflower growths, composed chiefly of wavy connective tissue with an epithelial covering.

Both mucous polypi and polypoid hypertrophy of the bladder are rare.

2. *Fibroma* and *fibro-myoma* are, if anything, still more uncommon than hyperplasia; only one case of pure myoma has been met with in the female bladder. These tumors are sometimes soft, more often hard and dense, generally pedunculated, with a smooth or bosselated surface, and occasionally of considerable size. Their vascular supply is usually small.

3. *Papilloma, or Villous Tumor; also termed Papillary Fibroma.*—These tumors, which are at the same time the most interesting and the most frequent form of primary vesical neoplasm, are developed from the most superficial or papillary layer of the mucous membrane. They are characterized by the presence of numerous more or less slender, club-shaped, or hair-like processes, each of which consists of one or more capillary loops enveloped in a delicate fibrous stroma and an outer covering of polygonal epithelial cells. These villi may be simple or dendritic, and vary in length up to an inch or more. They are sometimes quite evenly distributed over a considerable portion of the bladder, but more often float out from the surface of one or more small sessile or polypoid fibrous growths. Papillomata are usually small, but may reach the size of an English walnut. They have an especial predilection for the neighborhood of the vesical orifices, bleed readily on being touched, and simple villi or tufts of villi are apt to become separated from the mass of the growth and escape with the urine. They rarely occur before puberty, and are most frequent in those who have passed the climacteric. Occasionally a development of villi takes place upon a cancerous base.

4. *Sarcoma.*—Only four cases of primary sarcoma of the female bladder have been reported. One of these tumors (case of Schlegtendal[1]) was the size of a closed fist, white, bosselated, dense, with a smooth surface, and attached to the trigone. Voegtlein found nearly half the bladder infiltrated with a sarcomatous growth not exceeding 1 cm. in thickness at any one point. In Senfleben's case the growth was very soft, and tore so easily as to make traction with the forceps impossible.

5. *Carcinoma.*—While the bladder is frequently involved in cases of cancer of the vagina or uterus, primary cancer of the bladder itself is so rare that its existence even has been denied by as high an authority as Klebs. It seems, however, to have been met with in a few rare instances. Whether primary or secondary, it may be in the form of separate nodules, or it may infiltrate the vesical wall to a greater or less extent, or it may develop in the base, and later in the villi, of a pre-existing papilloma: in this way a benign villous tumor may become

[1] *Centralb. f. Gyn.*, 1885, 24 (4 S.) p. 52.

converted into villous cancer or papillary carcinoma, whose malignant character at an early stage is apparent only on microscopical examination. All forms of vesical cancer tend to become necrotic, and may so disappear that the resulting ulceration presents microscopically almost nothing suggestive of a cancerous origin, except perhaps a narrow margin of induration. The bladder is usually found adherent to the adjacent organs as a result of secondary pericystitis, or there may be a general peritonitis. Metastases and affections of the lymph-glands are exceedingly rare with vesical cancer.

6. *Vesical cysts* have been here and there described, but it is probable that most of these cases have had an origin external to the bladder, into which they have advanced by perforation (dermoids, hydatids). The possibility of a simple retention-cyst of the bladder is not to be denied, but no cases have been met with in the literature of vesical tumors.

Symptomatology.—Vesical irritation, with frequent, painful and sometimes difficult micturition, is a symptom common to all vesical tumors so situated as to press upon the vesical neck or obstruct the passage of urine. Sometimes there is absolute retention, in other cases incontinence, when a pedunculated growth has forced its way into the vesical orifice: this may proceed even to a spontaneous elimination of the tumor, as Brenecke[1] observed in a case where a polypus of considerable size was driven through the urethra and completely expelled after a series of vesical contractions which recurred regularly every five minutes for a number of hours. Except at micturition, pain is not a prominent feature of the benign vesical tumors; with the malignant forms it occurs in 75 per cent. of all cases as constant in and about the bladder and radiating into the back, loins, and thighs. Most vesical tumors give rise, sooner or later, to chronic vesical catarrh, which may have been preceded by long-continued irritation and hæmaturia or have developed suddenly without apparent cause.

By far the most characteristic symptom of vesical tumors is hæmaturia. Occurring now and then with other forms, with cancerous and villous growths it is rarely if ever absent. Occasionally late and not appearing until dysuria or cystitis has already called attention to the bladder, it is often, on the other hand, not only the first symptom of a benign villous growth, but it may be repeated at irregular intervals for years before other symptoms appear. The hemorrhage is sometimes very abundant; it is quite independent of exertion, and occurs often in the night, then ceasing, perhaps not to reappear for years. Meanwhile the health remains undisturbed and the urine retains its normal condition. This precocious hemorrhage of spontaneous origin is an especially valuable sign of vesical neoplasm. Eventually, however,

[1] *Centralb. f. Gyn.*, 1879, iii. S. 177.

hemorrhage becomes more frequent; the patient becomes excessively anæmic; and sooner or later all the painful symptoms of chronic cystitis are added to increase the general weakness and further depress the functional activity of the system. Finally, the patient becomes so reduced that even a hemorrhage of very moderate extent is sufficient to cause a fatal syncope, or death may occur from uræmia.

Such is the course of an ordinary papilloma when left to itself. With cancerous growths the progress of the disease is more rapid and inevitable. The patient soon becomes cachectic; the urine is foul as a result of ulceration within the bladder; hemorrhage is frequent and excessive; and the patient finally dies of exhaustion or perforative peritonitis. The average duration of the disease is about a year.

Vesical tumors are seldom large enough to be felt by bimanual examination: sometimes a thickening of the vesico-vaginal septum may be perceptible. The sound should be used with great care, since it almost invariably provokes considerable hemorrhage, and in several cases this has proved immediately fatal. In the presence of a solid tumor the sound may be deviated to the right or left, or perhaps cannot be passed beyond the vesical orifice of the urethra. In cases of villous tumor certain operators have experienced a sensation as if the beak were entangled or moving in a mass of hair. As a rule, the sound will give negative results. If a catheter be used, villi will occasionally get caught in the eye of the instrument, and prove of great diagnostic value; hence the eye should always be inspected and any contents saved for microscopical examination. The urine also not infrequently contains portions of villous tumors, as small fleshy particles of much paler color than the numerous small blood-clots, for which they might be easily mistaken. The urine should be allowed to settle, the clear portion decanted, and the sediment spread out upon a large glass surface; any suspicious particles may thus be readily seen and reserved for the microscope. The urine may in other respects be quite normal, or it may, on the other hand, present all the characteristics of chronic cystitis.

Diagnosis.—The symptoms described will most often arouse suspicion of vesical calculus, an affection which the use of the sound will at once render improbable. The endoscope may now and then enable us to see the neoplasm and acquire some knowledge as to its seat and extent. The certainty of the diagnosis when villous tufts are found in the urine or the eye of the catheter has already been spoken of. It is, however, desirable for operative purposes to know the size and extent of the growth, whether it is benign or malignant, and the nature of its attachment. These data are usually to be secured only by means of a digital exploration—a justifiable procedure whenever, in presence of a well-grounded suspicion or certainty of vesical neoplasm, it remains

doubtful whether its removal may not be effected through the urethra. It is needless to say that preparation to operate if necessary should be made previous to the dilatation, and if the growth be too large for removal through the urethra or of an infiltrating nature, so as to make an operation seem hazardous, the opportunity should be used to obtain a small portion of the growth by means of a curette or scissors. Except in those rare cases of primary cancer where some form of metastasis is discovered, the microscope alone will reveal the true character of the growth: a malignant sarcoma, for example, may present all the gross appearances of a simple mucous polyp.

Prognosis.—Fibromata and mucous polypi are dangerous only in so far as they cause obstruction and perpetuate a chronic cystitis, which may eventuate in disease of the kidneys. Villous growths mean certain death if left to themselves. They may, indeed, exist for a long time, with only an occasional hemorrhage, and twenty-eight years have been known to elapse between the first appearance of hæmaturia and the onset of dangerous symptoms. But more often in three to four years the inevitable cystitis appears, the hemorrhages become frequent and excessive, and a high grade of anæmia is developed: death may then result, either from exhaustion or secondary nephritis. Operation, however, usually affords complete relief in all forms of benign vesical tumors without renal complication. Stein[1] has collected 45 cases of operated tumors in females whose age varied from nineteen months to seventy-five years; of these, 13 were fatal, 3 relieved, and 27 completely cured; of the fatal cases, 5 were malignant, and in all of the others there was either some form of renal disease or the growth was imperfectly removed; 4 of the fatal cases were children under five years of age, in whom, as a rule, the prognosis is decidedly less favorable. Villous growths are somewhat prone to recur if only partially excised.

With regard to malignant disease but little need be said. With sarcoma the prognosis is not so absolutely bad, since in two cases of removal there was at least no immediate recurrence. Cancer of the bladder is probably always fatal, usually in ten to twelve months, although in rare cases life may be prolonged for two or three years.

Treatment.—It is evident that any benign tumor should be removed as soon as discovered. Even with malignant growths life may be thus prolonged, since hemorrhage is much less abundant, and often ceases entirely, if only the surface of the growth is scraped away. There are three ways in which a vesical tumor may be made accessible: by dilatation of the urethra; by vaginal cystotomy; and by suprapubic cystotomy. Of the 45 operations previously referred to, 37 were urethral and 8 vaginal.

[1] *New York Med. Record*, 1885, xxviii. p. 281.

As a general rule, small pedunculated growths should be removed through the dilated urethra. The left index finger in the bladder, assisted, if necessary, by counter-pressure behind the pubes and the middle finger in the vagina, fixes the tumor so that it can be seized with a pair of Simon's forceps, which are inserted along the finger. The tumor may be twisted off, or possibly it may be encircled by an écraseur, which is passed in over the shank of the forceps. Diffuse sessile and soft growths may likewise be removed through the urethra by means of the finger-nail or curette, both of which are of great value in certain cases: the spoon of the curette should be at nearly right angles to the shank. Sometimes a tumor, together with its vesical attachment, may be dragged down through the urethra and completely exposed at the meatus, so as to be accessible to knife or scissors.

When the tumor is large, or by reason of its situation upon the anterior vesical wall its base is inaccessible through the urethra, it must be removed by vaginal cystotomy. Kaltenbach, indeed, deems this method imperative in all cases of non-polypoid growths where careful extirpation of the base of the tumor is necessary; and this opinion is also supported by the experience of the author. Norton removed successfully a sessile tumor from the trigone by dissecting up the vaginal mucous membrane, and then excising the whole portion of the vesical wall occupied by the growth. Usually Simon's T-incision will be the best (see page 459), through which the neoplasm, together with its vesical attachment, can be completely inverted into the vagina. Schlegtendal[1] removed in this way a sarcoma as large as the closed fist, not hesitating to prolong the incision through the vesical sphincter, since the patient had long suffered from incontinence: the ends of a silk ligature, which had been passed around the pedicle by means of a curved needle previous to excision, were afterward carried out through the urethra, and the vaginal incision at once closed. The immediate result of this operation was perfect.

Suprapubic cystotomy has never been done in the female for a vesical neoplasm. It would be the only available operation in case of a large tumor occurring in a child. Still, even in children vaginal cystotomy is not at all impossible, since the vagina may be artificially dilated to a considerable degree, and calculi have been often removed in this way.

In general, it may be said that there is no unvarying rule of conduct applicable to the operative treatment of vesical tumors, but that the method of procedure must be adapted to each individual case. Senftleben removed a large tumor through the urethra, with fatal result from instrumental perforation; perhaps this could have been avoided by the vaginal method, which has the great superiority of enabling the opera-

[1] *Loc. cit.*

tor to see as well as feel. Stroinski[1] also had a vesical rupture follow an attempt to twist off through the urethra a tumor with a very strong attachment; he saved his patient, however, by the unique procedure of inverting the whole bladder through the urethra and sewing up the rent with catgut sutures, after which reposition was easily effected and the patient made a perfect recovery. While these cases illustrate the danger of manipulation through the urethra, it may be mentioned, on the other hand, that Simon[2] successfully scarped out through the urethra a tumor which occupied fully two-thirds of the whole vesical cavity.

Uncontrollable or even troublesome hemorrhage rarely attends the removal of a vesical tumor. When much hemorrhage occurs, it is to be controlled if possible by vesical injections of hot or cold water or of a solution of perchloride of iron (3 per cent.), or by a snug vaginal tampon and ice to the hypogastrium; ice may also be inserted into the vagina with very good results. In some cases perchloride of iron may be applied directly to the bleeding surface by means of brush and speculum. The same means are to be used in all cases of recurring hemorrhage from malignant or other vesical tumors which do not admit of thorough extirpation. In addition, the fluid extract of ergot should be given internally in teaspoonful doses, or ♏ x of dilute sulphuric acid may be combined with gr. x of gallic acid, and this mixture given every few hours. Opium is also an extremely valuable remedy. In case of recent hemorrhage the patient must also be kept perfectly quiet in the recumbent posture, with the pelvis slightly elevated; the diet must be restricted to milk and acidulated drinks, and constipation avoided by the use of mild enemata. The patient should refrain, if possible, from completely emptying the bladder, since it is at the end of micturition that hemorrhage is most likely to recur. When large clots of blood have collected in the bladder, they must be removed either by means of a large catheter, such as Ultzman has devised for this purpose, and a syringe, or, if this fails, by dilatation of the urethra.

§ 4. FOREIGN BODIES IN THE BLADDER.

These may be conveniently divided into two classes, the first including all foreign bodies and substances which enter the bladder from without, and the second those which develop within the bladder itself—*i. e.* vesical calculi.

1. Foreign Bodies from Without.

These may enter the bladder through a perforation of its wall or through the vesical orifices. Through a traumatic perforation splinters

[1] *Chic. Med. Journ.*, 1882, xlv. 478.

[2] Wiedt: *Arch. f. klin. Chirurgie*, 1875, xviii. 177.

of wood or bone, bullets, any sharp body upon which the patient has fallen, such as a lead-pencil, may enter the vesical cavity. An ulcerative perforation may connect the interior of the bladder with the small or large intestine, with an ovarian, dermoid, or echinococcus cyst, with an extra-uterine fœtal sac, or any suppurating cavity of the abdomen or pelvis. Thus entrance is occasionally given to fecal matter and gases, gall-stones, portions of undigested food, lumbricoids, oxyuris, and other intestinal parasites. Cases are reported where hair, bones, and teeth from dermoid cysts, or even the bones of an extra-uterine fœtus, have been emptied through a perforation into the bladder, and afterward voided, one by one, through the urethra. Daughter-cysts from a hydatid tumor have been passed in large numbers with the urine, having usually entered the bladder by perforation, but occasionally (case of Ainsworth) without discoverable tumor or fistulous opening. From the vagina, too, pessaries and other foreign bodies may ulcerate through into the bladder. Finally, a case has recently occurred where a portion of omentum was found post-mortem in the bladder, the hernia having taken place through an old perforation which had been freshly opened during an operative procedure.

More commonly, foreign bodies enter the bladder through one of the vesical orifices. Through the ureters come renal concretions in the form of gravel or small renal calculi, bits of renal tissue in cases of pyonephrosis, rarely the renal parasites Filiaria sanguinis and Distoma hæmatoform.

But the variety of objects which have at various times been inserted through the urethra, both by accident and design, is so great as to be almost innumerable. Now and then a catheter or other instrument is broken off within the bladder or is drawn in by negative abdominal pressure. Pessaries have been inserted into the bladder by mistake through an abnormally dilated urethra. Straws, pipe-stems, goose-quills, and the like are sometimes used by patients for purposes of catheterization and allowed to escape from the fingers into the bladder. More commonly, foreign bodies are intentionally introduced by hysterical women or in an attempt at masturbation; probably a large proportion of all cases occur in this way. The favorite article seems to be a hair-pin, but pins of every description, needles and needle-cases, nail- and tooth-brushes, pieces of wire, toothpicks, and so on *ad infinitum*, have been used for this purpose. Occasionally this has occurred in an attempt on the part of the patient to produce an abortion.

All foreign bodies which are not perfectly smooth and unirritating soon give rise to cystitis, and in an alkaline urine the body soon becomes encrusted with phosphates. In case of a hair-pin or other pointed object the sharp end is usually found imbedded in the vesical wall, and the free end alone is encrusted. The phos-

phatic deposit may take place very soon after the body has been introduced; in the short space of two weeks the incrustation may reach very considerable proportions. Foreign bodies often form nuclei for stones.

Symptoms.—Small bodies, such as hydatid cysts, gravel, feces, portions of blood-clots, and tufts of hair, may escape through the urethra soon after entrance, with more or less pain according to the nature of the substance. Intestinal gases are sometimes expelled with considerable noise, such as occurs at the anus, and the pain attending their escape is often quite considerable. Larger bodies which have a smooth surface may remain in the bladder for an indefinite time without causing inconvenience, but usually the presence of the intruder is at once followed by vesical irritation, with frequent micturition and tenesmus, and the urine soon indicates the development of cystitis.

Diagnosis.—In cases of vesical perforation the previous history of intestinal ulceration or of pelvic abscess or cyst will suggest the possibility of this lesion. Examination of the urine will then in most cases disclose muscular fibres, vegetable cells, or fecal matter from the intestine, or it may reveal large quantities of pus in case of a pelvic abscess or suppurating cyst. A simple fecal odor of the urine is not diagnostic of intestinal perforation, since this odor is met with in certain cases of parenchymatous cystitis where the vesical walls become so altered as to permit a sort of gaseous transudation from the intestine. The presence of any large foreign body, such as may have been introduced through the urethra, is usually to be recognized by vaginal touch, and more especially by the sound. As a general rule, no reliance can be placed upon any negative history given by the patient, since all knowledge of any such occurrence is usually denied. In some cases the diagnosis can only be made by a digital exploration.

The prognosis must be guarded until the exact nature of the foreign body, its source and complications, are ascertained. A vesico-intestinal fistula is a serious lesion, although closure may in some cases be effected; if it remains open, cystitis will also persist, and eventually the kidneys will become diseased. The result of a fistulous tract connecting the bladder with a pelvic abscess or suppurating cyst must necessarily depend upon the progress of the latter. With a traumatic perforation, even when the peritoneum escapes, there is always great danger of urinary extravasation. A foreign body introduced through the urethra may usually be removed with safety, and recovery be complete; on the other hand, if interference is delayed, the result may be either an exhausting cystitis, abscess of the vesical wall, sloughing of the vesico-vaginal septum, or a gangrenous cystitis and fatal perforation.

Treatment.—Any foreign body in the bladder must be removed at once, and if a communication exists between the bladder and intestine or other source of invasion, it must, if possible, be induced to close. Removal may in some cases be effected through the dilated urethra; in others resort must be had to vaginal cystotomy. Since many foreign bodies enter through the urethra, most of them can be removed through the same channel, unless already too heavily incrusted. In the latter case it will often be necessary to first crush with a lithotrite before extraction, as described farther on under Vesical Calculi. In general, the most useful instrument for the extraction of a foreign body is an alligator or Simon's forceps. After dilatation of the urethra the finger is first introduced, and the body brought if possible into the most convenient position for extraction, which is, of course, with its long axis corresponding to that of the urethra: this may often be facilitated by partially filling the bladder with water. Hair-pins, pieces of wire, and the like frequently lie transversely with imbedded ends; in this event the central portion may sometimes be hooked down with the finger, so as to double the pin upon itself and at the same time free the ends; if it breaks, as often happens, the two halves will be left in a very favorable position for extraction. Barbed points imbedded in the base of the bladder may be pushed through into the vagina, and thence removed. Great care must be taken in any of these manipulations not to bruise the vesical or urethral wall, and if after full dilatation the body cannot be easily extracted without force, and crushing be considered impracticable, vaginal cystotomy should be done without further hesitation.

For the treatment of pelvic abscesses or suppurating cavities which discharge their contents into the bladder, the reader must be referred to other sections of this work. So long as the discharge continues the bladder must be washed out daily with an antiseptic solution. A fistulous communication with the intestine may, however, receive direct treatment at its vesical opening. This may be brought within the field of a urethral speculum and thoroughly cauterized with the solid stick, or the latter may be successfully applied by the aid of the touch alone, as recently demonstrated in a case reported by Voegtlein.[1] In this patient the fistulous opening was found encircled by polypoid growths, and after cauterization of the fistulous edges the discharge of feces and gas through the urethra soon began to diminish, and eventually ceased. In case of failure through the urethra the same treatment may be more effectually applied by partially inverting the bladder through a vesico-vaginal incision, or possibly, as Winckel suggests, the fistula may then be closed by sutures. Meanwhile, in either case, the diet should be restricted, the bowels kept in check by astringents or mild opiates, the

[1] *Correspondenzbl. d. Schwertzer Aerzte*, 1879, ix. 388.

recumbent posture maintained, and the bladder be kept clean by constant lavage.

2. Vesical Calculi.

Calculus is a rare affection in the female, occurring only in the proportion of one case to every twenty met with in the male. This fact is satisfactorily explained by the shortness and dilatability of the female urethra, small particles being thus furnished with a ready means of escape, instead of being retained in the bladder to form nuclei for stone. Again, of the calculi found in women the proportion of purely phosphatic stones is much greater than in men, and that of uric-acid calculi correspondingly less: most authors attribute this difference to the greater frequency in the male of the uric-acid and gouty diatheses. Oxalic and cystine calculi are very rare.

The origin, therefore, of vesical calculus in the female is usually to be sought in the presence of a foreign body in the bladder which has developed a cystitis and served as a nucleus for a phosphatic deposit. Many of these foreign bodies have already been enumerated. Teeth from a dermoid cyst, seeds of various fruits, fecal particles, and the like have been found in the centre of stones; so also pins, needles, buttons, and all sorts of small articles introduced from without by hysterical women. Other nuclei may be furnished by the bladder itself, most frequently as blood-clots, also clumps of epithelium and of pus-cells, bits of tumors or necrotic tissue, possibly colonies of bacteria. Any abraded or ulcerated surface is especially apt to become incrusted, and hence it is that calculi so frequently develop after the operation for vesico-vaginal fistula, the first deposit probably taking place upon a suture or a denuded surface. Emmet regards this operation as one of the most fertile sources of calculi in women, but thinks the latter may be avoided by greater care in the apposition of the denuded surfaces. In rare instances such calculi probably form previous to the closing of the fistula, and escape notice because of their retention in the upper portion of the contracted bladder: as soon as closure of the fistula enables the bladder to fill with urine the stone falls to the base, where it soon gives evidence of its presence.[1] The tendency to the formation of calculi with vesical tumors and in any diverticulum, hernia, or similar malposition of the bladder, has already been noticed; hence the occasional occurrence of stone in a saccular dilatation or the vesical pouch formed behind the neck of the retroverted uterus or in a cystocele.

The vesical walls in cases of stone are more or less hypertrophied and, as a rule, inflamed. The stone may in rare cases be completely encapsulated, either in a sacculus or at the mouth of a ureter, or from having

[1] Campbell: *Am. Gynec. Trans.*, 1876.

wandered from the latter situation between the layers of the vesical wall. The urethra may be found somewhat dilated as a result of spontaneous efforts of the bladder to expel the stone.

Calculus may occur at any age, but is by far more frequent in children than in adults,[1] and in some cases it is congenital. As many as one hundred and eighty stones have been found in a single bladder; usually, however, only one stone is present.

Symptoms.—A perfectly smooth stone may cause no symptoms whatever, or at most occasional sudden cessation of the stream at micturition before the act is completed. This symptom is, however, by no means as constant in cases of calculus as is usually supposed; it often disappears entirely with the growth of the stone and its consequent inability to enter the vesical neck. Most stones have a more or less irregular surface, and give rise to vesical irritation, and eventually to catarrh. Micturition is then frequent, painful, and often difficult. Constant pain in the vesical region or shooting into the loins, thighs, and joints is frequently complained of. Hæmaturia is seldom wholly lacking, and it is markedly characteristic of calculus that these two symptoms, pain and hemorrhage, are usually exaggerated after physical exertion or by any jarring motion, such as riding over a rough road. Hemorrhage is also especially liable to occur at the end of micturition, when the bladder contracts upon the rough stone. In the recumbent posture, when the stone falls away somewhat from the irritable vesical neck, and is no longer jolted about by movements of the body, all the symptoms are greatly alleviated. Children with vesical calculus are apt to suffer from a constant irritation of the external genitals; hence the clitoris is often found greatly enlarged in consequence of frequent rubbing, or the habit of masturbation may have been thus induced. Another not infrequent result in children of the vesical tenesmus caused by stone is prolapse of the rectum, and more rarely of the urethra. Still another symptom in children is incontinence, especially the nocturnal variety.

A vesical calculus by prolapsing in front of the advancing head may prove a serious complication of labor. Of 29 cases of calculus in pregnant women collected by Winckel, 5 were relieved of the stone by operation previous to the onset of labor; 7 were spontaneously delivered, but with resulting lesions of more or less gravity (vesico-vaginal fistula and incontinence); in 8 obstetric operations were necessary to effect delivery (manual extraction, forceps, perforation); in 7 cases the stone was removed during the progress of labor; one stone caused abortion, and was afterward spontaneously expelled; while in only 1 case was the attempt to replace the calculus during labor successful.

Numerous cases have been reported where calculi were spontaneously

[1] Hyland: *Des Calculs de la Vessie chez la Femme et les Petites filles*, Paris, 1872; Winckel: *Berlin. Klin. Wochenschr.*, 1875, p. 127.

expelled from the bladder. This occasionally occurs through the vesico-vaginal septum in consequence of suppurative inflammation and the formation of a fistula. Much more commonly expulsion is effected through the urethra, and the passage of a stone whose smallest diameter was 3–4 cm. has happened repeatedly. Bryant has seen a stone measuring even 20 by 14 cm. in circumference expelled through the urethra without resulting incontinence, although so fortunate a termination is by no means to be anticipated in the majority of cases.

The DIAGNOSIS of calculus is in most cases easily made by means of the sound: the characteristic click produced by gently knocking the beak of the instrument against the stone is quite unmistakable. A grating sensation alone is not so reliable, since this may proceed from a simple phosphatic deposit upon the vesical wall. Vaginal—or, in children, rectal—touch will also in most cases reveal the presence of a hard body in the bladder, and if the latter is full the sensation of ballottement may be obtained. By means of bimanual palpation the stone may often be grasped between the fingers and its size roughly estimated. The possibility that the stone may be encapsulated must be borne in mind—a condition to be suspected if the stone does not appear to change its position or the click of the sound is always elicited in exactly the same locality: in case of any doubt as to diagnosis digital exploration should be made through the dilated urethra.

Conditions for which calculus has been mistaken are—pelvic exostoses, fibroids of the anterior uterine wall, and even the body of an anteverted uterus. Especially when complicating labor the stone, if jammed down in advance of the head, may have every appearance of a hard, immovable tumor growing from the symphysis pubis. It seems hardly necessary to do more than mention these possible sources of error, and to again emphasize the necessity of using the sound whenever there is any possibility of calculus.

Now and then neuralgic pain is the especial symptom of calculus to which the greatest prominence is given by the patient, while the urinary symptoms are perhaps deemed scarcely worthy of mention. Here, again, the habit of a routine examination of all the pelvic organs is the only safeguard against blunders in diagnosis.

PROGNOSIS.—The operation for stone is much easier and safer in women than in men, on account of the shortness and dilatability of the urethra and the accessibility of the bladder though the vagina. The prognosis, therefore, in adults depends chiefly upon the complications. We have already seen that these may be grave: there may be vesico-vaginal fistula with serious loss of tissue, incurable incontinence from dilatation of the vesical sphincter, or a chronic cystitis with ulceration and fatal degeneration of the kidneys. Complicating pregnancy, a stone may produce abortion or necessitate a serious operation during

labor. While, therefore, most women with calculus can be radically cured, and a moderate cystitis rapidly vanishes after removal of the stone, the prognosis must, as a rule, be somewhat guarded. This is still more applicable to children, in whom the smallness of the parts sometimes makes it necessary to resort to hypogastric cystotomy—an operation which is always attended with great danger. Of 56 cases of calculus operation in girls under the age of fifteen collected by Wreshan,[1] hypogastric cystotomy was necessary in 4, and of these 2 recovered; of the remaining 52, 1 was fatal, 7 were followed by permanent incontinence (all cases of lateral incision of the urethra), and 44 were completely successful.

Treatment.—This must vary according to the size and density of the stone, its complications, the age of the patient, and the previous experience of the surgeon. Of the various operations which have been at different times in vogue, the superiority of the following four has been abundantly proved:

Dilatation of the urethra;
Lithotrity;
Vaginal cystotomy;
Hypogastric cystotomy.

(*a*) Dilatation of the urethra should never be carried beyond a diameter of 2 cm. in adults, and 1.5 cm. in children if incontinence is to be avoided. This operation is therefore suitable only for stones which do not exceed these limits, and for these it is undoubtedly the best. The patient must be etherized, placed in the dorsal position, and after free dilatation the stone may be extracted with an alligator or Simon's forceps, provided this can be effected without the use of force, which must be carefully avoided in order that the urethra may escape injury. One or two fingers in the vagina—or, in children, in the rectum—may greatly assist the forceps in grasping the stone in its most favorable diameter. Ogston[2] advises dilatation and conjoined manipulation alone as a means of extraction, the stone being worked by the fingers into and along the urethra; the method should certainly be tried with small stones, as being the simplest and least likely to cause a urethral tear.

(*b*) The attempt should be made to crush any stone which cannot be easily drawn through the dilated urethra or which has otherwise proved to be large. For lithotrity, dilatation need only be carried to the size of a Bigelow evacuating-tube; gm. 150 or 200 of water are then injected into the bladder, the stone crushed by means of an ordinary lithotrite, and the fragments washed out with a Bigelow evacuator, or, as advised by Heath,[3] with an ordinary hand-syringe through a urethral speculum. If the urethra has already been considerably dilated in the hope

[1] *Op. cit.* [2] *Edin. Med. Journ.*, 1879–80, xxv. p. 26. [3] *Lancet*, 1882, p. 1067.

of extraction with forceps, a simple Erichsen or Dolbeau crusher may often be used, such as is employed in the operation of lateral lithotomy in the male. Lithotrity is especially valuable in children, in whom, owing to the narrowness of the parts, the vaginal operation presents certain difficulties.

(*c*) Extraction through a vesico-vaginal incision is rendered necessary under the following conditions: when the stone is large, and too hard to be readily crushed; when incontinence renders it impossible to keep the bladder sufficiently full of water for working the lithotrite; when the stone is encapsulated or lies in a sacculus or cystocele or the opening of a ureter, so as to be inaccessible through the urethra; and, finally, when a severe cystitis makes a vesico-vaginal incision advisable also for purposes of drainage.

The operation need not, however, be necessarily restricted to so narrow a field. Any stone, hard or soft, may be properly removed in this way if the operator be experienced in dealing with vesico-vaginal fistulæ. Lithotrity has its drawbacks, and in the hands of a novice it is quite liable to result in serious injury to the bladder or urethra, either from the blades of the instrument or from sharp fragments of stone which escape crushing. Vaginal cystotomy, on the contrary, is a clean operation, devoid of danger, easy of execution, and objectionable only because of the resulting fistula. These two operations may therefore be fairly said to contest the field for all uncomplicated stones beyond a certain size, and choice will be made according to the previous experience and skill of the individual operator.

The operation itself of vaginal cystotomy does not differ from that already advised for certain cases of cystitis. A straight longitudinal incision will suffice in most cases, or it may be necessary to enlarge it by the transverse cut in front of the cervix uteri recommended by Simon. The opening must be large enough to admit of easy extraction; any bruising or laceration of the edges may cause sloughing and a resulting fistula which is difficult to heal. In those rare cases where the stone is more or less encapsulated it may be liberated by incision: Emmet[1] has met with three cases in which the stone lay in the mouth of a ureter; in one he was able to extract by the curette-forceps; in another an incision was made through the vagina directly upon the stone, which was thus removed without entering the vesical cavity. If necessary, a stone may be crushed through the vaginal incision by means of an Erichsen or Dolbeau forceps, after which evacuation will be easily effected by means of a stream which is forced in through the urethra.

Vaginal cystotomy is practicable in children as well as in adults: the hymen should be incised, and the vagina may then be rapidly

[1] *Op. cit.*

dilated to a sufficient extent to permit the passage of a comparatively large stone. Seven of Wresham's cases were operated in this way with a uniformly good result.

The after-treatment must depend upon the state of the bladder. If there is a chronic cystitis, the cut may be left open and the same course pursued as in other cases of cystotomy for relief of this disease. If the bladder is healthy or if only a mild or recent catarrh exists, the opening should be closed at once with interrupted silver sutures. Since the cut is clean and there is no cicatricial tissue, perfect union may, as a rule, be confidently expected.

(*d*) Hypogastric cystotomy is of course never to be thought of except as a last resort in cases where the stone is too hard and too large to be removed in any other way—a condition hardly to be anticipated in other than very small children. (For a description of this operation the reader is referred to works on general surgery.)

§ 5. VESICAL NEUROSES.

Under this head are included all affections of the bladder in which a disorder principally of its nervous apparatus is to be presumed. This disturbance is usually motor, and will be considered under the two forms of cystospasmus, or exaggerated functional activity of the muscular system of the bladder, and its reverse, vesical paralysis. Sensory disturbances are by no means uncommon, but they usually accompany the various spasmodic affections, and it seems hardly necessary to make what would be a purely artificial separation between the two forms.

1. Cystospasmus, or Irritable Bladder; Neuralgia vesicæ.

By cystospasmus is meant an exaggerated muscular activity of the bladder, of reflex origin. This may be confined to either the vesical detrusor or the sphincter, or both together may be involved, and in either case the spasm is usually attended with considerable pain. These various factors, spasm of the detrusor, spasm of the sphincter, and pain—either one of which may be in one case the most prominent, and in another scarcely noticeable—have usually a common etiology, and are more or less associated in each individual case. They are therefore commonly grouped together under the convenient name of "irritable bladder." It is, however, to be constantly borne in mind that this term represents not a disease, but merely a growth of symptoms of which the common origin is always to be sought.

The class of women most prone to suffer from these affections is the hysterical and neurotic, also those of a weakly and scrofulous constitu-

tion. In the great majority of cases the condition is secondary to other local or constitutional affections, but occasionally it is apparently idiopathic, and is brought on by exposure to cold, such as wetting the feet or sitting in a damp place or by sudden change in temperature from a hot into a cold atmosphere. It occurs also with emotional disturbances, such as fright, grief, anger, or any long-continued excitement. Excessive venery and onanism are not uncommon causes.

Among the numerous affections to which irritable bladder may be secondary, only those which are external to the bladder itself are here to be considered. Many of these have already been fully described as lesions of the urethra; for example, urethral stricture, dilatation, and tumors. Next in order come the affections of the other pelvic organs, and of these the uterus is probably most often at fault. Any malposition of this organ, or any enlargement, as from pregnancy, neoplasm, or metritis, which causes pressure upon the bladder or dragging upon the vesical neck, will probably cause irritable bladder: the same is true of cervicitis and cancer of the cervix. The vagina may furnish a source of vesical irritation in the shape of painful ulcerations, neoplasms, or foreign bodies. Various lesions of the rectum—ulcerations, fissure, stricture, hemorrhoids, prolapse, abnormal contents, such as oxyuris, ascarides, tænia, and fecal impaction—often give rise to reflex spasm of both vesical detrusor and sphincter. So also affections of the ovaries, such as neuralgia and the various forms of enlargement. Again, vesical irritation almost invariably attends parametritis, pelvic peritonitis, and hæmatocele (spasm, externally of the sphincter, is very apt to follow operative procedures in the pelvis, more especially in the vagina and upon the cervix uteri), often, it is true, as a result of direct extension of inflammation upon the vesical wall, but also indirectly through nervous channels. From the kidneys a direct irritant may be brought to the bladder in the form of pus, uric-acid concretions, a highly concentrated urine, or various ingested substances, such as asparagus, alcohol, and certain well-known drugs. Finally, irritable bladder occurs with many affections of the central nervous system: it is very common with hysteria and in spinal irritation, especially in that form occurring in young girls at puberty.

The most common form of irritable bladder is more or less frequent micturition, unattended with any great pain and caused by a reflex spasm of the vesical detrusor. Only a little urine collects before an urgent and irresistible desire to empty the bladder is again felt. This may be easily accomplished in most cases, while in others the sphincter, as well as the detrusor, is involved in the spasm, and the bladder is emptied with more or less difficulty. If the spasm is only moderate, the stream may flow in full force after a little straining on the part of the patient. In worse cases there is, in addition, a succession of pain-

ful clonic spasms of the sphincter, which render the stream jerky and irregular, and continue for some time after the bladder is emptied—a symptom commonly known as tenesmus. Spasm of the sphincter is not, however, necessarily associated with spasm of the detrusor, but may occur as a quite independent affection. Sometimes this is of mental origin, as when the sphincter refuses to open in the presence of another person; more often it is reflex, caused, among the other diseases mentioned, most often by vaginismus and painful affections of the rectum. In such cases catheterization may be very difficult and painful; even over-distension of the bladder may be a direct result of the spasm.

Cases are also met with in which neuralgia is the most prominent symptom, occurring as a constant severe pain in the bladder which radiates into the surrounding parts, and is usually attended with more or less tenesmus and frequency of micturition. These cases are often of malarial origin and in the form of paroxysms which recur at regular intervals.[1]

The urine from an irritable bladder may be quite normal, or it may present certain features of very common occurrence in hysterical and neurotic individuals. Polyuria is one of the most frequent anomalies; more rarely there is oliguria. In other cases the amount of phosphates is increased, and the urine is passed slightly alkaline or cloudy, without there being any inflammatory condition of the urinary passages or previous ingestion of alkalies. On heating such a urine there is a precipitate of earthy phosphates, which may be again dissolved by the addition of a few drops of acetic acid—a test of some value in the diagnosis of a neurosis.[2] A slight degree of glycosuria is occasionally met with, also an excess of urates or crystals of calcic oxalate. In some cases the amount of indican is largely increased.

The DIAGNOSIS of irritable bladder can only be made after a careful examination of the urine, and of the vesical interior by means of sound and endoscope, has excluded all other affections of the bladder itself. The sound will, however, often disclose considerable hyperæsthesia of the vesical wall, and it may encounter great resistance from a spasmodic condition of the vesical sphincter. The diagnosis is incomplete until the source of reflex disturbance has been found, for upon the latter must depend both prognosis and any successful line of treatment.

TREATMENT.—No one should be content with simple medication of the urinary passages unless satisfied that the attack is of idiopathic nature; and the time and care necessary to ferret out the source of irritation in each individual case render this affection one of the most difficult to treat successfully. For the immediate relief of painful spasm

[1] Gross: *The Urinary Organs*, 1851.

[2] Ultzman: *Neurosen d. Harnwege*, Wien. Klinik, 1879, v. 119-164.

opiates will often be necessary, or trial may be made of chloral hydrate or bromide of potassium: the chloral may be given in doses of gm. 1.25–2, in a small enema of starch-water. Other internal remedies which often give relief are tincture of gelsemium in doses of gm. .60 every six hours, and tincture of belladonna, gm. .06 every hour. Sitz-baths, hot douches, and heat to the hypogastrium are especially valuable in allaying all forms of vesical irritation. When the paroxysms are periodical, quinine should be tried, and in case of irritating urinary ingredients the diet must be restricted and diluent drinks be largely used. When there is persistent spasm of the sphincter which other means fail to relieve, dilatation of the urethra may be performed with a very good prospect of at least temporary improvement. The general condition must never be overlooked in the treatment of irritable bladder; and here, again, as in most vesical neuroses, signal results often follow the use of general galvanism. Once more, however, attention is drawn to the fact that it is only by discovery and removal of the cause of irritation that success is to be obtained in the treatment of most cases of this affection.

2. Paralysis Vesicæ.

Paralysis, as well as spasm, may affect either the detrusor or sphincter muscle. By the term "paralysis of the bladder," however, there is usually understood to be chiefly a paralysis or paresis of the detrusor, in consequence of which there is partial or complete retention of urine. Paralysis of the sphincter, on the other hand, results in incontinence, of which a peculiar variety, occurring chiefly in children, is called enuresis.

(*a*) *Paralysis of the Bladder.*—Etiology.—A certain amount of vesical atony or paresis usually accompanies advanced age, and corresponds to the various other forms of senile atrophy; such a condition may be greatly exaggerated by habitual over-distension of the bladder. In the young and middle-aged partial or complete retention of urine is the usual cause of vesical paralysis, the vesical walls becoming so thinned and stretched that the power of contraction is temporarily or permanently lost. In some cases the habit of retaining the urine for long periods is acquired. Not infrequently, young girls, on account of modesty or lack of convenient opportunity, refrain from emptying the bladder for long periods, with consequent over-distension and temporary paralysis. Strong mental emotion may for the time being so blunt the sensibility of the bladder that the desire to empty it is not felt, and the urine is allowed to accumulate. Hysterical women often retain their urine for long intervals, even when there is no spasm of the vesical sphincter.

The most common cause of retention is some mechanical obstruction which prevents the complete emptying of the bladder. Most of the causes of such obstruction have been frequently referred to in the section on Cystitis and elsewhere, such as a retroversion, especially of the gravid uterus; dislocations of the bladder, such as attend pregnancy and the puerperium; organic stricture of the urethra; spasm of the vesical neck, such as often follows operations about the vagina, pelvic tumors; and the like. The retention which often follows delivery is worthy of special emphasis, and three distinct forms are to be noted: first, that which may appear in the first few hours after labor from doubling of the urethra upon itself in consequence of the sinking of the emptied uterus; second, retention from obstructive œdema of the urethra, which often comes on twenty-four hours after delivery in connection with the swelling of the whole parturient canal; and, lastly, retention in the course of the second week after delivery from a puerperal pelvic cellulitis and resulting œdema of the vesical walls. With certain constitutional diseases, such as septic conditions, typhoid and other infectious diseases attended with a fatty degeneration of the tissues, the vesical wall may likewise suffer and lose its contractility. Kussmaul[1] has observed vesical paralysis in certain cases of lumbosacral neuritis which is propagated from inflammatory conditions of the kidneys. The frequent occurrence of vesical paralysis with cerebrospinal affections and all forms of coma is well known.

Symptoms.—With partial retention and paresis the patient may make no complaint except that there is no sense of relief after micturition. Not infrequently a normal quantity of urine is passed at regular intervals, and yet the bladder is found abnormally distended. More often micturition is frequent because of the constant sensation of a full bladder, and from the catarrh which develops sooner or later in most cases of retention. The stream of urine has but little force, or it may simply dribble from the meatus, micturition being accomplished only by dint of great straining on the part of the abdominal muscles. In the worst cases there is complete incontinence—a condition called ischuria paradoxa on account of the constant dribbling of urine in connection with a distended bladder. This occurs in the later stages of chronic vesical paralysis, also in severe cases of acute retention when the sphincter has become mechanically dilated by the weight of urine above, or is also paralytic. Eventually, the retention of urine, and consequent ammoniacal fermentation, result in chronic cystitis and secondary degeneration of the kidneys. In rare cases rupture of the bladder may take place, especially if there be ulceration or a favoring fall or blow upon the abdomen.

In case of great distension, palpation and percussion of the hypogas-

[1] *Würzburger med. Zeitschrift*, 1863, iv. p. 56.

trium reveal a rounded pyriform tumor, usually but not always in the median line, and reaching in some cases above the umbilicus: this tumor represents of course the distended bladder. The catheter in cases of paralysis, even if passed immediately after micturition, will always withdraw a certain amount of residual urine, and the stream from the catheter will be very weak or fall perpendicularly from its mouth. In some cases the amount withdrawn is almost incredible, even when the patient feels quite certain that she has recently emptied the bladder: instances are quite numerous where under such circumstances a gallon or more of urine has been obtained.

The DIAGNOSIS of vesical paralysis, especially when the latter is incomplete or associated with paralysis of the sphincter, must depend upon a thorough knowledge of the conditions under which paralysis is liable to occur, and especially upon the recognition of retention. When the latter is sudden and complete, it will hardly escape notice, but those cases where micturition is frequent or where there is actual incontinence are extremely liable to be misinterpreted and catheterization neglected. The rule should be strictly observed to make a careful abdominal examination in every case of incontinence, and to use the catheter in every case of abdominal tumor which could possibly be a distended bladder. If there is simple retention without paralysis, the stream will flow with nearly or quite its full force, instead of simply falling from the mouth of the catheter; as soon as the obstruction is removed the patient will be able to empty the bladder herself, and the catheter, which should be again inserted immediately after micturition has been accomplished, will show that there is no residual urine. In cases of more chronic paralysis, with regular micturition or perhaps incontinence, suspicion will be aroused by the advanced age of the patient, complaint that great straining is necessary to empty the bladder, that no sense of relief follows the act, and that the stream has lost its natural force. Here, again, the catheter must be introduced immediately after micturition, and in the absence of cystocele, of painful spasm at the vesical neck when the instrument is passed, and of mechanical obstruction, a residuum of urine affords certain proof that the function of the detrusor is impaired.

The PROGNOSIS must evidently be greatly influenced by the cause and the complications. Chronic paralysis, such as occurs in advanced age or follows vesical hypertrophy or is secondary to disease of the nervous centres, can be at most only relieved. In recent cases which result from acute retention the prognosis is favorable if the cause itself can be removed.

TREATMENT.—The most important indication in all cases of retention and possible paralysis is obviously to empty the bladder, in order that it may be able to assume its former dimensions. The catheter

is not, however, to be too rashly used in all cases of retention, especially at the outset when the danger of injection is greatest. Even with all possible care, catheterization may be the means of bacterial invasion of the bladder, and consequent cystitis. It is therefore advisable in cases of acute retention to first endeavor to induce spontaneous evacuation by the removal of any obstruction, and by hot hip-baths and hot applications above the pubes. If this can be brought about and clear urine is passed, nature alone may effect a cure if the urine is not again allowed to accumulate.

In the great majority of cases the catheter must be used, and here the utmost caution is demanded. The genitals should first be carefully washed, and the catheter inserted *à découvert*. A fresh glass tube should be employed, through which a stream of carbolized water is flowing at the moment of insertion.[1] Not more than 500 cc. of urine should be withdrawn at first, and the patient should be kept in bed for at least twenty-four hours after the catheterization. If in withdrawing this amount the bladder is completely emptied, 200–300 cc. of carbolized water should be immediately injected, and left in the bladder until the next catheterization unless voluntarily expelled by the patient: this precaution is necessary because of the exceedingly dangerous and sometimes fatal cystopyelitis which has not infrequently followed the complete emptying of a paralytic bladder by the catheter—a result attributed by Ultzman to the negative pressure in the bladder and kidneys, and termed by him a "hyperæmia ex vacuo."[2] The cystopyelitis may be purulent, gangrenous, or hemorrhagic, and is often attended with the formation of abscesses in the kidneys.

In two or three hours after the first partial evacuation with the catheter the bladder should be completely emptied and washed out with a 1 : 300 carbolic solution. If the patient then is able to pass voluntarily a certain amount of urine, the paralysis is probably only temporary, and a daily catheterization and washing will be sufficient. In other cases the process must be repeated three times daily until the bladder has partially regained its tonicity. After each washing 100 cc. of the carbolized solution should be left in the bladder, in order to prevent the painful contact of the vesical walls with each other and as a general antiseptic precaution: as the case progresses this amount may be gradually diminished. This same course of treatment is to be pursued in chronic cases, and a complicating cystitis is to be managed in the usual way. In some cases the patient herself must be taught to use the catheter, which should then be of soft rubber and be kept scrupulously clean.

Electricity is a valuable means of treatment in certain cases, but its

[1] *Vide* "Treatment of Cystitis."

[2] Ultzman: *Neurosen d. Harnwege*, Wiener Klinik, 1879, v. 119–164.

use should not be begun until catheterization and washing alone have been tried for at least several weeks. It is best to use both the galvanic and faradic batteries on alternate days. With the former one pole should be placed over the lumbar vertebræ and the other over the hypogastrium; with the faradic current, one pole should be attached to a vesical electrode which is carried into the bladder, and the other applied alternately to the lumbar cord, interior of the vagina, and hypogastrium. Alternate hot and cold douches to the lumbar region are also valuable.

The best remedies for internal use are strychnia in doses of gm. .001–.002, and ergot in doses of .10–.20 three times daily; the general health must receive attention and tonics used if necessary.

(*b*) *Incontinence of Urine, Paralysis of the Sphincter*, in adults, is so rarely a primary lesion, and the various forms which result from mechanical causes, advanced age, central nervous affections, and the like have been so frequently mentioned in the preceding pages, that it will be sufficient here to state one or two ways in which we may attempt to relieve this usually incurable affection. Now and then it is found in young women as an affection which has followed them from childhood, and under these circumstances there is more hope of cure. Besides tonics and other internal remedies, such as strychnia, ergot, and cantharides, the galvanic current is a valuable method of local treatment, and may be applied by means of a urethral electrode, which is carried just up to but not within the vesical sphincter. Ultzman advises catheterization every one, two, or three hours in some cases of paralysis of the sphincter, in order to relieve the muscle for a time from all strain. When the incontinence seems to be due merely to nervous exhaustion and debility, a generous diet, change of scene, sea-baths in certain cases, and cold douches to the lumbar region may have a beneficial result. Finally, Fritsch[1] has succeeded in curing several cases of incontinence by removing a small rectangular piece of the vaginal mucosa just over the vesical sphincter, and bringing together the longitudinal edges of the denuded surface by silver sutures: theoretically, a fold may be supposed to be thus doubled in at the vesical orifice which forms a sort of mechanical impediment to the escape of urine. Many cases of incontinence are absolutely incurable, and a urinal must be permanently worn.

(*c*) *Enuresis* (*nocturna, diurna, continua*).—This term is applied to a form of paresis of the vesical sphincter which occurs chiefly in children, and is characterized by the involuntary escape of urine at certain intervals. It is usually nocturnal, and, although perhaps more frequent in nervous and weakly children, it is by no means uncommon in those who are otherwise healthy and robust. Girls are quite as subject

[1] *Frauenkrankheiten*, 1888.

to it as boys, and it generally disappears with adolescence, although it may exceptionally continue into adult life.

In regard to the pathology of this affection there is a great difference of opinion. The enuresis is variously referred by different authors to bad habit, spasm of the detrusor, hyperæsthesia of the vesical neck, and atony or paresis of the sphincter. While the occasional influence of each of these factors is not to be denied, it seems probable that in most cases there is primarily a more or less defective innervation of the vesical sphincter. With all children up to the age of two years this is the normal condition: micturition as well as defecation is an involuntary act, not because of any defect in the muscular development of the sphincter, or of any hyperæsthesia of the vesical membrane, but because the reflex mechanism which causes the sphincter to contract as the bladder becomes filled is imperfectly developed. Enuresis may be regarded as a simple persistence of the infantile condition, aggravated in many cases by a reflex vesical irritability. Hence vulvitis and vaginitis, rectal parasites, urethral tumors and fissure, pruritus ani et vulvæ, and a host of other conditions, such as have been described in the section on Irritable Bladder, are always to be looked for as possible exciting causes. In other cases enuresis is probably due in part to certain dreams, like the somewhat analogous seminal emissions of adults. Occasionally it is nothing more than a bad habit which the child might easily overcome.

Treatment.—These various etiological factors show how important it is to make a judicious selection of remedies in the treatment of the individual case; for if the bladder is already hyperæsthetic, strychnia or electricity, which are very serviceable in cases of pure paresis of the sphincter, are distinctly contraindicated. The first and most essential point is to find whether there is any cause of reflex irritation, and if possible to remove this cause. If this fails to give relief, or if, as often happens, no cause is found and the presence of hyperæsthesia remains doubtful, the internal treatment should be begun with sedative remedies, as if dealing with a case of purely irritable bladder. Belladonna is the drug most universally recommended, and it may be given at the outset in doses of gm. .30 of the tincture three times daily, and afterward gradually increased in amount until the physiological effect is produced: its use must in many cases be continued even for months before any marked benefit is obtained. The bromides and chloral hydrate are sometimes efficient: Winckel has had excellent results from doses of gm. 1–1.5 of the latter at night in girls of twelve to fifteen years. A small quantity of Dover's powder at night, repeated for a few days, may serve to break up the habit.

When there is no reason to suspect a condition of hyperæsthesia the vesical stimulants should be employed. Strychnia is perhaps the most

valuable of internal remedies, and must not be administered in too small doses; with careful watching we may begin with gm. .001 three times daily, and gradually increase this dose to gm. .002. Gross considers powdered cantharides an especially valuable remedy in doses of gm. .002 three times daily in combination with strychnia and perhaps a little opium. Last and most important comes electricity, which Ultzman calls the remedy *par excellence* for enuresis: it may be easily applied by means of a rectal electrode, such as the above-named author has devised for this purpose.

In addition to local and specific treatment, the general health must often be improved by the use of cod-liver oil and iron. Shower-baths, lumbar douches, and sea-bathing will often prove of benefit when well borne. The child should be made to eat a light supper, should be kept from all excitement in the evening, and be compelled, if possible, to sleep on the side rather than on the back. The urine should always be examined, since appropriate cases have been cured by the simple use of diluent drinks. In those exceptional cases where wilfulness on the part of the child seems to be the most probable cause, there is no better form of moral treatment than the topical subcutaneous injection of a syringeful of warm water.[1]

In the preparation of the foregoing section the author has to acknowledge the great assistance which he has received from Dr. Herbert B. Whitney, who has shown much patience and perseverance in looking up the literature of the subject as well as in the arrangement of the material.

[1] Henoch: *Kinderkrankheiten.*

NON-MALIGNANT TUMORS OF THE UTERUS.

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Fibro-myomata or Fibroid Tumors.

Synonyms.—Fibro-myomata,[1] or fibroid tumors; myo-fibromata;[2] fibrous tumor;[3] tumeur fibreuse;[4] hysterome;[5] fibroma uteri;[6] myoma;[7] tuberculum;[8] cellulo-fibrous bodies;[9] steatoma, etc.[10]

Definition.—The familiar terms fibroid tumor, fibro-cystic tumor, and fibroid polypi of the uterus every medical man recognizes as belonging to the same class of neoplasms. We all understand by the fibro-cystic tumor that a solid fibroid tumor has undergone a cystic degeneration. Notwithstanding our familiarity with these terms, they are objectionable, because they do not convey to the mind a comprehensive idea of the pathology of the neoplastic growths to which they are applied. The term fibroid (*fibrosus* and *eidos*) and the term fibrous mean fibre-like, and are only applicable to a tumor composed entirely of fibrous tissue. The fibrous or fibroid tumor found in various localities is always situated in connective tissue; it contains only occasionally a few yellow elastic fibres, is often quite vascular, has no distinct capsule, and must be dissected out.

But the so-called uterine fibroid contains a variable quantity of muscular tissue as well as of fibrous tissue, both of which are derived from the parenchyma of the uterus in which the tumor grows. By reason of the presence of muscular tissue Virchow proposed that these tumors be called myomata. This term designates only their muscular element, and is as objectionable as the term fibroid. The term myo-fibromata or fibro-myomata fully designates the solid tumor, and the prefix cystic that variety in which cystic degeneration has occurred.

[1] Virchow. [2] Thomas. [3] English writers. [4] Amussat.
[5] French writers. [6] Klob. [7] Virchow. [8] Morgagni.
[9] Bayle. [10] Voigtel.

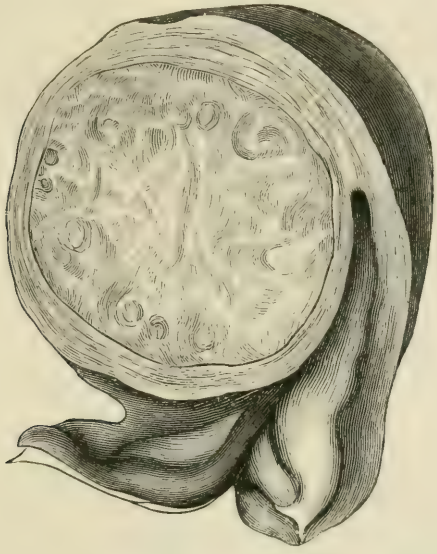
Etiology.—The etiology of these tumors is still a mystery. They are more frequent in the black than in the white race. In both races they are more frequent in the body than in the neck of the uterus, and more frequently situated in the posterior than in the anterior wall. Prior to puberty they present no positive symptoms of their existence. From a careful analysis of the case of a highly-intelligent lady under my care for many years I believe that the neoplasm does sometimes exist prior to puberty. After the menopause is established these tumors generally disappear unless they have undergone cystic degeneration. Bearing on this point I have at present an anomalous case. My patient is forty-three years of age. She has never menstruated in her life, has never shown any physiological evidence of ovulation, has been twice married, is now a widow, and is childless. She has had for ten years a large fibro-myoma of the uterus, which thus far shows no evidence of atrophy.

If prior to the establishment of the menopause the fibro-myoma has undergone cystic degeneration, it will continue to grow. The removal of the ovaries and Fallopian tubes in such cases by Mr. Lawson Tait and Dr. Bantock has proved insufficient to stop the growth of the cystic or very soft fibro-myoma. Months after removal of both ovaries and tubes I have seen Dr. Bantock compelled to make a supravaginal hysterectomy. Concerning the causes which produce these tumors nothing is known. By reason of their existence a woman may be sterile, but it is not yet proven that sterility favors their origin or growth.

Pathology.—The tumor always has its origin in the substance of the uterine wall or subperitoneal connective tissue. It begins as a hard nodule, involving in its further development both the muscular and fibrous tissues. Later it becomes invested with a thick layer of fibrous tissue, which, with the superimposed uterine tissue, constitutes its envelope or capsule. Within this capsule the blood-vessels ramify and form a network, sending prolongations to feed the enclosed growth, which now lies like a foreign body in or attached to the wall of the uterus. Rarely large blood-vessels penetrate the substance of the tumor. Such tumors have, however, been observed by Virchow, Leopold, and Schroeder, in which large blood-sinuses existed, the walls of the sinuses being composed of the muscular fibre of the uterus involved in the growth of the tumor. Klebs has proved the existence of lymphatics, and Lorey of nerves in this class of growths. The presence of lymphatics often determines the variety of future cystic degeneration. As the tumor enlarges it separates the tissues composing the uterine wall or compresses it as it pushes the peritoneum outward. The consequent irritation invites a greater blood-supply and hyperplasia of the walls begins. As the tumor excites more and more

irritation, and the muscular tissues of the uterus grow stronger, the neoplasm, if developing within the walls, may begin to advance either toward the peritoneal covering of the uterus or toward the endometrium. Should, however, its location favor, it may separate wider and wider the uterine tissues, keeping its relative position from either surface. Thus the tumor is finally fixed in the uterine walls, and is designated as interstitial or intramural (Fig. 153); or if it is developed or forced toward the peritoneum, carrying the latter with it as an

FIG. 153.



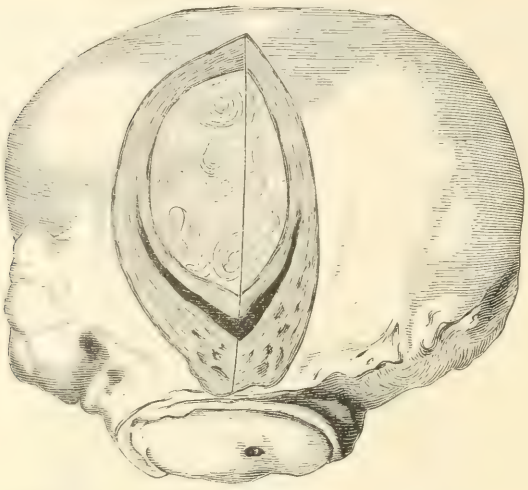
Interstitial Fibroid Tumor.

investment, it is then designated as subperitoneal (Fig. 154); or if it has advanced toward or been developed near the cavity of the uterus and rests beneath the endometrium, it is designated as submucous (Fig. 155).

FIG. 154.

Pediculated Subperitoneal Fibroid Tumor.

Fig. 155.



Submucous Fibroid Tumor, projecting into uterine cavity.

The tumor may consist of a single nodule or centre of formation, or it may consist of a number of nodules or centres of formation interlaced closely and invested by a common capsule (Fig. 156).

Fig. 156.

Section of a Large Fibroid Tumor, with the fibres arranged around several centres.

This fact suggested to Mr. Lawson Tait a new nomenclature for these growths—namely, uninodular and multinodular fibro-myomata.

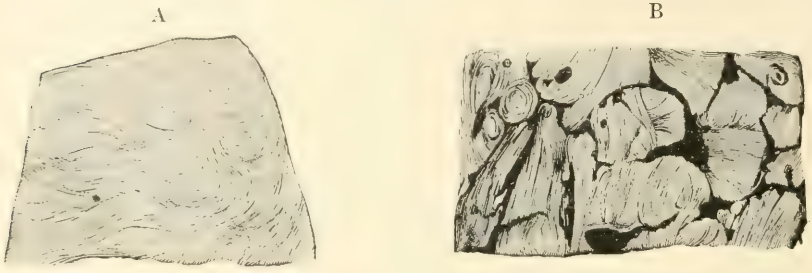
As the tumor grows, either the fibrous tissue or the muscular tissue will preponderate. When the fibrous tissue is bountiful, the tumor will be hard, even as hard as cartilage; when the muscular tissue is most bountiful, the tumor will be softer, even sufficiently so as to merit the name fleshy tumor or myoma. A tumor largely composed of fibrous tissue will usually be of moderate size and of very slow growth, but the reverse is apt to occur in those tumors in which the muscular tissue preponderates; and these tumors are especially liable to cystic degeneration. On the other hand, the latter class, if cystic degeneration does not occur, are liable to rapid disappearance after the establishment of the menopause. Not infrequently several separate and distinct fibro-myomata are found in the same uterus. Thus I have seen eight small subperitoneal fibro-myomata attached to the surface of the uterus of an old negro woman who, prior to the post-mortem, gave no evidence of their existence. Thomas exhibited to the New York Pathological Society a uterus containing thirty-five tumors of various sizes, and Schroeder of Berlin cites a case by Schultz in which at least fifty tumors existed in the uterus. A remarkable feature of Schultz's case was that the woman was eighty-three years of age. The uterus was obtained post-mortem. In cases of multiple myomata the growths may be so distributed in the uterus as to present the subperitoneal, the intramural, submucous, and polypoid varieties.

The changes occurring in the uterus itself are not constant. The muscular tissues hypertrophy to a greater or less extent in all cases, and, while hypertrophy is going on in one direction, atrophy of the muscular tissue on the side toward which the tumor is advancing may also be in progress. After the tumor has become subperitoneal the uterus may atrophy to a very marked degree—a condition not infrequent in old subjects. The cavity of the uterus is usually increased in depth, while in the submucous and intramural variety it may also be obstructed. The lining membrane of the uterus, by reason of the constant hyperæmia, is more vascular, bleeds more readily upon the introduction of the sound, than in cases of normal condition, while in cases of submucous fibro-myomata or polypoid fibro-myomata menstruation is almost always profuse, and between the regular periods blood is frequently lost or even constantly. In addition to this a serous discharge, intermingled with the vaginal and uterine secretion and having an unpleasant odor, is not always wanting. The uterus in no instance occupies its normal position, but is either pulled or pushed into an abnormal one, dependent on the size and position of the tumor. The cut section of fibro-myoma will vary in appearance according to the preponderance of its constituents. If the fibrous tissue be very abundant, the section will cut like cartilage, and have a gray color and satin-like glossy

appearance (Fig. 157, A). If the muscular tissue exists to a marked degree, the consistency of the section will be softer and the color will vary from pink to red.

The lymphatic spaces of Klebs are sometimes seen between the bundles of muscular tissue (Fig. 157, B). When but little muscular tissue

FIG. 157.



Sections of Fibroid Tumor: A, wavy bundles of fibrous tissue; B, spaces between bundles of fibrous tissue.

is present the section will be smooth, but if the reverse is the case the surface is uneven, as the contracting fibrous bands force the softer muscular tissue above the surface. At the margin of the section and surrounding it is found a layer of condensed fibrous muscular tissue forming the capsule. (See Fig. 156.) This is sometimes closely, at other

FIG. 158.

× 220

Structure of Fibroid Uterus, showing waving bands of long spindle cells, with rod-shaped nuclei of plain muscular tissue, the nuclei stained with carmine. At one point a few cells divided transversely (not nat., by H. Arnoth).

times loosely attached to the tumor. Frequently it is easy with the thumb-nail to detach it entirely, a process we shall yet learn to be that of "enucleation." On microscopic examination of the harder variety are

seen wavy bundles of fibrous tissue with a small amount of unstriped muscular tissue. (See Fig. 157.) The softer variety presents, in addition to the fibrous tissue, a greater amount of unstriped muscular fibres in twisted bundles, the muscular fibre being identical with the muscular fibre of the uterus. If the specimen be stained in carmine solution and washed in a solution of acetic acid, the rod-shaped nuclei of the spindle-shaped cells will be brought into view (Fig. 158). The important practical point in this is to establish a positive differential diagnosis between the fibro-myoma and sarcoma. The latter, when removed from the uterus, as elsewhere, is almost sure to return, and constitutes what has been erroneously called the recurrent fibroid tumor.

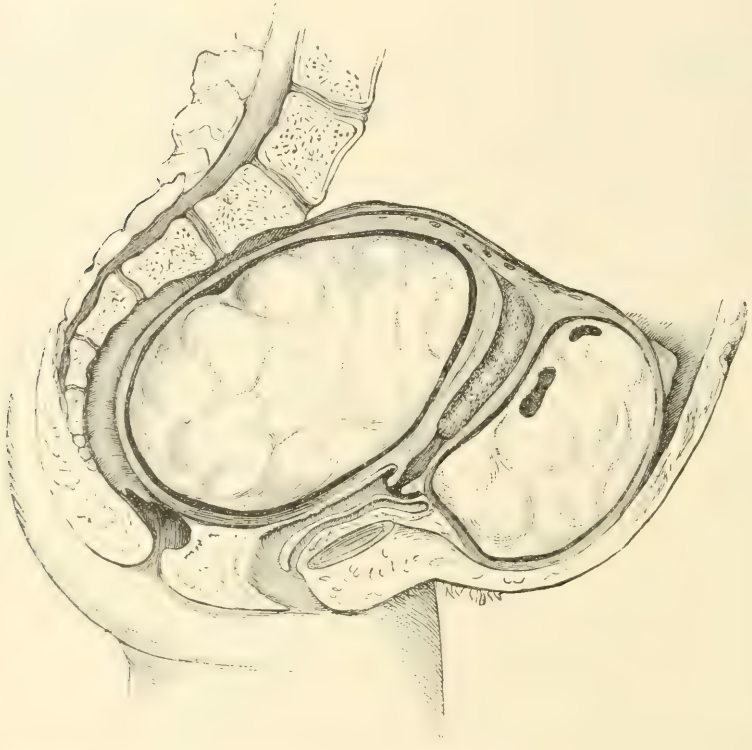
The nuclei of the spindle-shaped sarcoma-cells are round or oval; of the fibro-myomata, they are rod-shaped. The limit of growth for the hard myomata is difficult to determine. They have after removal been found to weigh fifty or sixty pounds. Until expelled from the walls of the uterus they maintain a globular form. After extrusion into the cavity of the peritoneum they are free from the pressure of the uterine muscular tissue, and generally lose the globular form. After extrusion into the cavity of the uterus they usually become pear-shaped—a fact probably due to the lateral pressure now exerted upon them in the expulsive efforts of the uterus. Their density varies with the amount of fibrous tissue in their composition, and is a determining element in the shape of their future growth, when they become subperitoneal. The globular form is not, however, infrequently retained in very solid tumors after they have become polypoid tumors, either upon the exterior or interior surface of the uterine walls (Fig. 159). The irregularity of surface occasionally seen is due often to the multinodular composition of the neoplasm, some nodules growing faster than others by reason of obtaining a better blood-supply. Another element in determining the shape of the subperitoneal tumor is the pressure against the walls of the pelvis; regularity of contour is more apt to exist when the tumor has become too large to enter the small pelvis. Occasionally, in addition to the mass in the pelvis, a prolongation of the tumor upward, cone-like, is felt through the abdominal wall. I have seen the tumor pear-shaped, the big end up, and the other end filling the pelvis completely.

Frequently the tumor, when subperitoneal, may be felt extending above Poupart's ligament, dragging the uterus with it side by side, it being difficult or even impossible to decide, when the os is almost or entirely out of reach, which is tumor and which is uterus. The sound may determine. If the cervix can be seized with a volsellum forceps and the uterus be thus moved, while the free hand over the abdomen takes cognizance of the movements, it may also be determined.

The changes which occur in fibro-myomata are as follows—varieties of softening:

Œdema.—At the time of the menstrual period I am sure I have seen them occasionally swollen or œdematous, this condition disappearing again a few days later. But this condition may continue to such a

FIG. 159.



Large Fibroid Tumors, one in the anterior, the other in the posterior, wall of the uterus.

degree that a spurious fluctuation may exist. Such tumors have been tapped for ovarian cysts, and a few drops of yellow, slimy mucus, escaping, told of the error of diagnosis, or the tapping has been dry. I have seen such tumors give apparently real and distinct fluctuation after being extirpated and laid on the table. A beautiful example of this I witnessed in the operating-room of Professor Küster of Berlin. The tumor when cut through was completely infiltrated; in the meshes of fibrous tissue hundreds of very small cysts existed, and the muscular tissues of the growth had wellnigh disappeared. Such tumors have been found by other operators. The œdema is sometimes intermittent, returning after entire subsidence.

Fatty Degeneration.—After the menopause, and occasionally after

pregnancy, complicated with intramural fibro-myoma, fatty degeneration occurs in the muscular element of the growth; this is absorbed and the fibrous tissue alone left. Some years ago I saw a lady with a large intramural fibro-myoma who afterward became pregnant, was delivered near full term, and in the process of uterine involution the tumor disappeared. In very old subjects the remains of prior fibro-myomata are simply nodules of the concentrated fibrous tissue.

Myxomatous Degeneration.—Occasionally in the tissues comprising the growth there exists mucoid tissue which secretes mucus, and forms often cavities of considerable size; this condition of the tumor is known as myxomatous degeneration (Virchow).

Suppuration.—Should the blood-supply be entirely cut off from the growth, as in twisting of the pedicle in the subperitoneal variety or of the polypoid submucous variety, or if the capsule be widely detached in an effort at enucleation per vaginam, the tumor may die and soften. This change has been designated erroneously as suppuration. True inflammatory softening and suppuration of a fibro-myoma is rarely seen, but Dr. M. D. Mann[1] reports having seen a pus-cavity containing two quarts in the middle of a fibro-myoma.

Gangrene.[2]—The submucous variety is especially liable to necrosis and spontaneous expulsion. An inflammation of the capsule resulting in interference with the nutrition of the growth, or inducing an ulceration on the surface of the capsule, is the usual cause. The resistance of the capsule being impaired by the opening, the tumor is expelled by uterine contractions entire or piecemeal. This fact led to the treatment of this variety by means intended to open the capsule through the cavity of the uterus. Atlee and Brown gouged holes in the capsule or divided it with the knife. Greenhalgh attacked the capsule with the cautery-iron. Byford[3] induced rupture of the capsule with ergot. Cures have been obtained by all of these methods, none of which are free from danger. Gangrene of the subperitoneal variety has been observed. Cases of inflammation of the capsule, adhesion to and perforation of the abdominal wall, followed by the escape of the gangrenous neoplasm, have been reported by Soir,[4] Dumesnil, Gutierrez, Hofmokl, and Schmidt.

Varieties of Induration.—After fatty degeneration of the muscular elements their absorption follows, but the fibrous tissue is left behind and contracts to form a very hard but small tumor. When the tumor contains very little muscular tissue it is nearly as hard as cartilage.

Calcification (Fig. 160).—Chalky or phosphatic degeneration of these tumors has long been known. Hippocrates relates such a case, a Thessa-

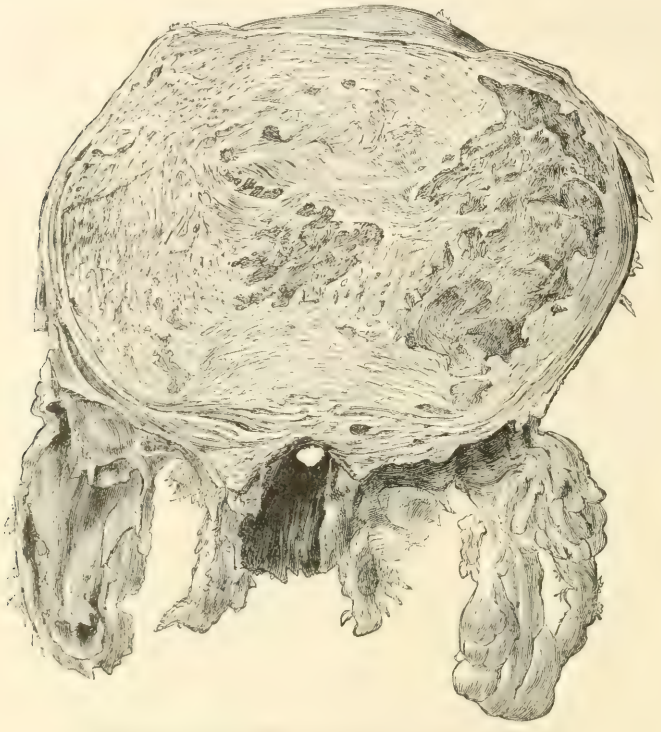
[1] *Amer. Journ. of Obstet.*, vol. xx. p. 462.

[2] Byford, Barnes, Thomas, Winckel, Gusserow, and others.

[3] *Amer. Gyn. Trans.*, vol. i., 1876. [4] Winckel: *Diseases of Women*, by Parvin.

lian woman aged sixty years; and Salius the case of a nun who had such a tumor. Schroeder refers to such cases by Louis, Velpeau, Jaffe, and Saxinger. A few years ago I removed a subperitoneal fibro-myoma

Fig. 160.



Ossified or Cretified Fibroid Tumor of Uterus (half size).

which was larger than a goose-egg and nearly as hard as a stone. It was reached through the posterior vaginal wall. The cretaceous matter appears first, says Schroeder, in streaks through the interior of the tumor. It may finally become so dense as to produce a stone of sufficient solidity to require to be cut through with a saw. The small tumors, especially the subperitoneal and intramural, are most liable to this change. When the blood-vessels are cut off the nutrition ceases. The tumor is now a foreign body, and is apt to act as such. It may cause an inflammation of the adjoining tissues, and when these are softened it may escape into the peritoneal cavity, causing fatal peritonitis, or, escaping into the uterine cavity, be expelled, leaving the patient to recover. In my own case the cretaceous material was in lamellæ and formed a complete shelly layer over the surface. It was producing frequent attacks of peritonitis, for which reason I removed it. The patient was a negro woman. True suppuration

of a fibro-myoma must be rare, yet authors authenticate it after traumatic injury to the growths, and also in association with cretaceous degeneration. Beyond the changes already referred to, these tumors, by various processes of degeneration, become cystic, and occasionally are apparently attacked with that most malignant of diseases, sarcoma.

Cystic Degeneration (Fig. 161).—A solid fibro-myoma may become

Fig. 161.

Large Three-lobed Fibroid, springing from the fundus by a somewhat thin pedicle, of which CF is cystic, while SsF and the dark shaded mass behind the uterus are subserous.

cystic through fatty degeneration, mucous degeneration, suppuration, serous infiltration, the formation of lymph-cavities filling with a clear fluid coagulating on exposure to the air, or from breaking down of clots in large blood-cavities already existing in the tumor. In the multinodular tumors one or more of the nodules may break down, while others maintain their original solid condition, and a mixed tumor results. As already observed, these growths take largely to themselves the connective fibrous tissue of the uterus. Connective tissue is that in which alone we find sarcoma developing in the body. The fibro-myoma and sarcoma are first cousins as to origin, and when the sarcoma begins, with its spindle cell and oval or round nucleus, to invade the myoma, it finds the natural tissue of its selection to work upon. Myomata thus invaded grow softer, and may even undergo cystic degeneration, and give rise to a tumor properly designated sarcomatous cystic fibro-myoma.

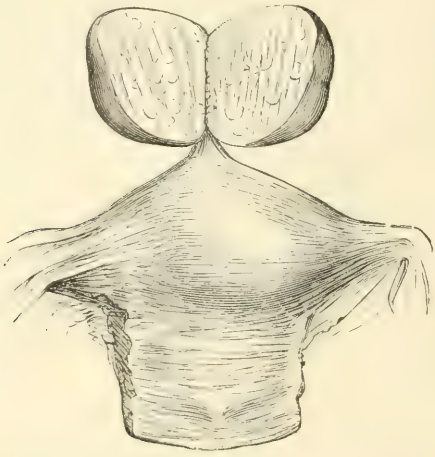
The termination of the cystic fibro-myoma is widely different from that of the simple fibro-myoma: while the latter occasionally destroys

the woman (especially the submucous variety), the former always tends to terminate fatally. Fibro-cystic tumors grow more slowly than ovarian cystomata, but by mechanical interference with respiration, circulation, and nutrition, and by producing nervous exhaustion, and also occasionally by causing a great loss of blood from the uterus, they tend with equal certainty to the destruction, sooner or later, of the life of the patient.

The location of simple fibro-myomata has everything to do with their importance; it is therefore excusable to make the arbitrary division of subperitoneal, interstitial or intramural, and submucous; also to consider each variety separately.

Description.—Subperitoneal Fibro-myomata (Fig. 162).—Virchow termed this variety the peritoneal polyp, and there is no difference of

FIG. 162.



Subperitoneal Fibroid Tumor of Uterus, pediculated.

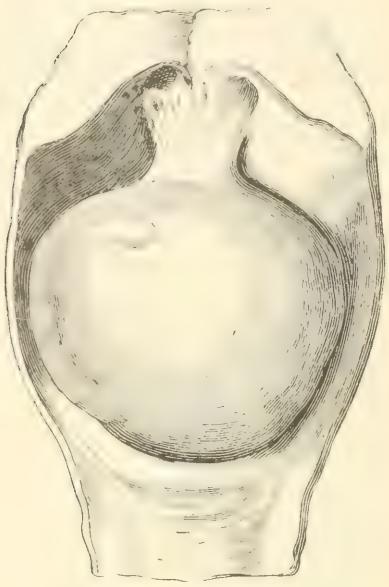
structure between it and the fibro-myomatous polyp found in the uterine cavity. When the tumor is forced out of the uterine wall into the cavity of the peritoneum, it carries with it the peritoneum investing the uterus, except in those cases where it projects from the side of the uterus and is pressed out between the layers of the broad ligament, which subsequently forms a serous covering for it. The tumor may remain closely adherent to the wall of the uterus, or, gradually leaving, develop a pedicle which may after a time remain thick or become so attenuated as to consist of nothing but two layers of peritoneum, the intervening cellular tissue and blood-vessels, some lymphatics, and nerves. The tumor continues to grow in the cavity of the pelvis, toward which it gravitates, retroverting the uterus early only if attached to the posterior wall, until finally it reaches such a size that it cannot enter the superior strait of the pelvis.

When the tumor projects from the top or anterior wall of the uterus, the latter is retroverted as soon as the growth has attained considerable size. The growing of these tumors thus in the pelvis gives rise to distressing vesical and rectal irritation, and often to retention of urine, to the narrowing of the calibre of the rectum, to constipation, to hemorrhoids, and to anal fissure. Besides this, there is often pain in the course of the sciatic or crural nerves of either side. The irritation and obstruction to the circulation, both from the mechanical presence of the growth and the malposition of the uterus, have in those cases which I have observed produced profuse bleeding at and between the menstrual epochs. That such was the pathology I have frequently proved by putting the patient in the knee-chest position, pushing the tumor and uterus up, and supporting them with pledgets of cotton saturated with glycerin, and by the free use of large quantities of hot water thrown against the vault of the vagina after the replacement was effected. Thus I have cured long-continued hemorrhages the result of this variety of the fibro-myoma. Once the tumor has become subperitoneal, it may contract adhesions to the pelvic viscera against which it rests, and thus it often happens in abdominal section that we find these tumors nourished by large blood-vessels entering them through adhesions, which, when the tumor is large and projecting into the cavity of the abdomen, frequently contain veins of enormous size. Twisting of the pedicle when long in these tumors may occur as in the ovarian tumor. If a new blood-supply has been, prior to this accident, established, the tumor will not die, even though it may be eventually separated entirely from the uterus. When this variety of tumor drags the uterus upward, or when the base of the pedicle is broad and the tumor falls backward, bending the uterus, the cavity is increased in depth; as the pedicle becomes elongated the uterine cavity shortens whether the tumor decreases in size or not. I have seen the uterus flattened out completely and adherent to the side of the tumor. After it has contracted adhesions to the intestine any rotary motion of the tumor is liable to produce intestinal obstruction and to demand immediate operative interference to save the life of the patient. Recently I have removed enormous fibroid tumors from which it was necessary to detach several loops of the small intestine. This variety of tumor is frequently accompanied by others of the same variety, either also expelled from or still existing in the walls of the uterus. The greatest limit of growth as a rule for this variety is the size of an adult head, but they have been met with having a weight of fifty to sixty pounds.

Submucous Fibro-myomata (Fig. 163).—As already stated, at least two varieties originate in the walls of the uterus as round tumors; when forced toward the lining membrane of the uterus they become submucous. As they project into the uterine cavity they carry the lining

membrane before them. The pedicle of this, the polypoid variety of the tumor, may be thick, containing muscular tissue, the lining membrane of the uterus, and very small blood-vessels. As long as the tumor lies beneath the unuplifted uterine lining it is round, but after it enters the cavity of the uterus and is macerated in constant discharge, and pressed upon by the contracting uterine walls, it becomes pear-shaped, or if nipped near the centre by the fibres of the internal os it may resemble a dumb-bell or hour-glass. This variety of the myomata does not undergo cretaceous degeneration, and is usually expelled too soon to undergo cystic degeneration.

FIG. 163.



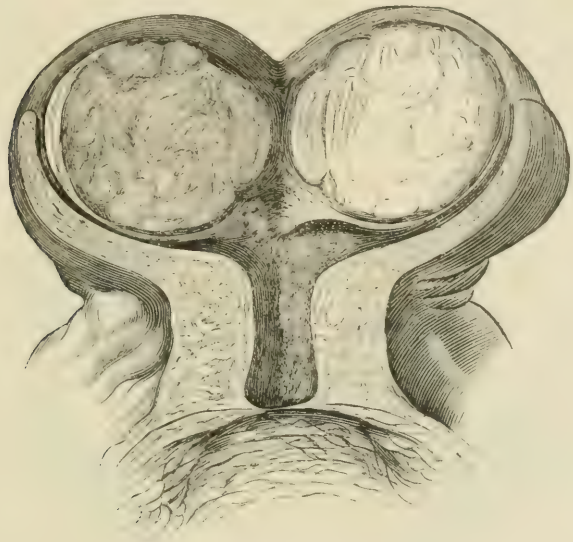
Submucous Fibroid.

Cystic degeneration occurs rarely in this variety, but it has been met with by Schroeder and others, and I know of one case. Nevertheless, it is probable that lives are as often lost from hemorrhages occasioned by this variety as by either of the other varieties of the myomata. This variety drags down the uterus when of moderate size, and after expulsion from the uterus may by its weight as it descends drag the fundus uteri down and invert the uterus. Women often hide these growths, even after they appear at the vulva, and I have known one woman to carry one for a long time dangling by a very thin pedicle between her legs. The size of the growth is determined mainly by the length of time it remains in the uterus or vagina. When in the vagina I have known the tumor mistaken for an inverted uterus, and verified the error by removing the tumor.

The Intramural or Interstitial Fibro-myoma (Fig. 164).—This variety simply remains and grows within the uterine walls. Surrounded on all sides by uterine tissue, it receives a greater blood-supply than either of the other varieties. It consequently grows with greater rapidity, and often to an enormous size, enlarging a patient like a full-term pregnancy, and weighing twenty pounds and upward. The great weight stretches the anterior wall of the belly, and the tumor overhangs, while it rests upon the pelvic brim. The abdominal walls grow very thin from pressure, and the recti muscles atrophy and separate, and the tumor lies immediately under the superficial tissues of the

belly-wall. These tumors, bulging out the uterus laterally, spread apart the layers of the broad ligaments, and the tubes are spread out high up on the tumor, or the uterus and the tumor may develop in such a way as to entirely alter the relative position of the uterine appendages. In these cases the cavity of the uterus is deepened or shortened and often rendered crooked, while at the same time it is very difficult

FIG. 164.



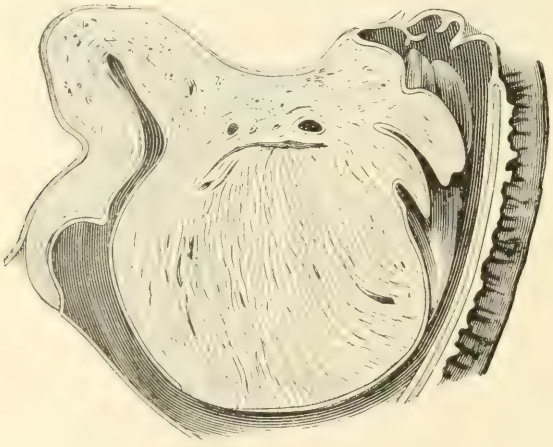
Intramural Fibroid.

to find the os uteri in the vagina. These externally large tumors are usually single, and the walls of the uterus may be found either greatly hypertrophied, or in old subjects much atrophied. These tumors occasionally undergo cystic degeneration, and a few years ago, by post-mortem, I removed one which, with its fluid contents, weighed more than sixty pounds. The patient died from exhaustion associated with brown atrophy of the heart—a condition certainly not infrequent.

Fibro-myoma of the Cervix Uteri (Fig. 165).—These tumors follow the same law as to location and development that they do in the body of the uterus. They may be subperitoneal when developed in the supra-vaginal portion; when developed too low down they very rarely appear upon the outer surface of the cervix—viz. the outer surface of the vaginal portion. The growth is much more rare in the cervix than in the body. In the twenty-two years I have been in practice I have met with but three cases where the growth was in the cervix. In one the growth was submucous, and in a second interstitial and as large as a

lemon; in the third the tumor was as large as a fœtal head. Where they become submucous they are gradually forced into the vagina, retaining their uterine connection through a pedicle of varying density (Fig. 166, *b*). When interstitial and large they pack the pelvis to a great extent. The lip of the cervix invaded is spread out over the growth, while the opposite lip is thinned and stretched as a band along the circumference of its enlarged neighbor. The uterus is dragged down until the growth has become large, when its fundus is deviated at first in a direction corresponding to the lip of the cervix invaded. When the tumor is expelled from the cervix it will be oval or round-ended, and when pouting between the labia may readily be mistaken for the fundus of the inverted uterus (Fig. 166, *a*). On the other hand, the uterus has been mistaken for this variety of fibro-myoma,

FIG. 165.



Fibroid in Cervix Uteri.

and by the late Washington L. Atlee was cut off with the écraseur, the patient recovering. Large growths in the cervix are more liable to produce vesical and rectal symptoms than those growing either from the posterior wall or fundus of the uterus.

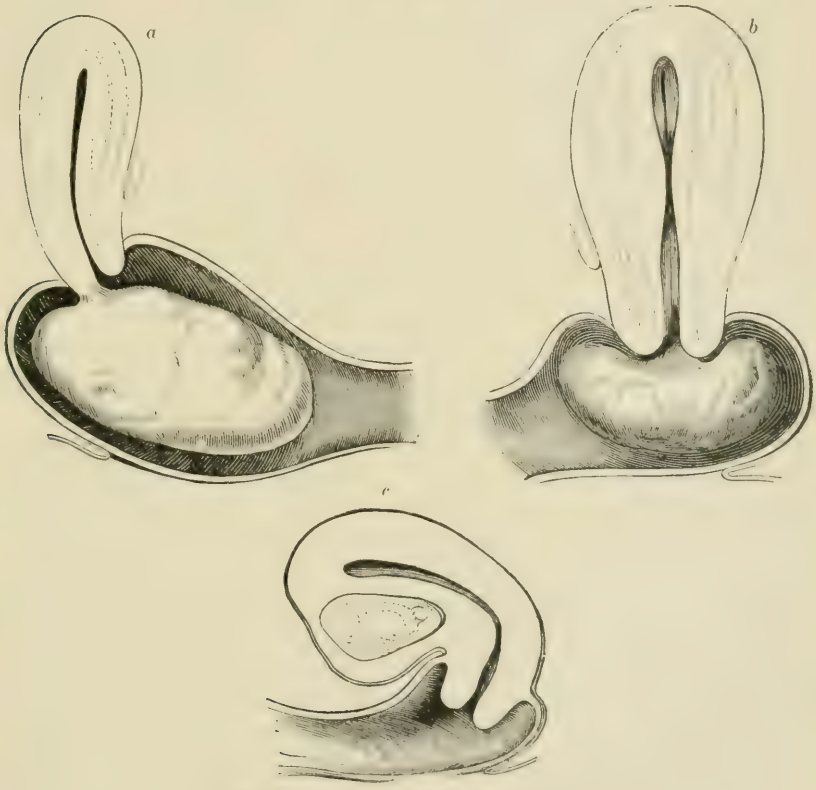
SYMPTOMS.—The symptoms which accompany the presence of these tumors in their various localities and stages of growth are widely different, as we shall learn in considering the diagnosis. However, a class of indications are patent as found in a vast majority of the cases, and may be tabulated as follows:

A. Vague pain in the pelvic region;
B. Pain referred to the front or back of the leg;
C. Irritability of the bladder or rectum;
D. Uterine tenesmus;
E. Menorrhagia or metrorrhagia;

F. Dysmenorrhœa;
G. Profuse leucorrhœa;
H. Serous discharge from the uterus.

The disorders of menstruation, the tenesmus, the leucorrhœa, and the serous discharge, are typical, within the menstruating age, of the existence of the submucous fibro-myoma, and in a less marked degree in the interstitial variety. They may be entirely absent in the subperitoneal

FIG. 166.



Fibroids attached to Cervix in Vagina.

variety. It may be inferred as a rule in diagnosis that tumors producing these symptoms to a marked degree are situated immediately beneath or close to the lining membrane of the uterus. Exceptions to the rule do occur, for I have seen free hemorrhages accompany the existence of a subperitoneal fibro-myoma packed in the pelvis.

Progressive anæmia from loss of blood, feeling of weight, and depression of spirits, the development of unusual nervous conditions, irritability, loss of cheerfulness, and gloomy apprehensions, are frequent. When the tumor rises out of the pelvis it may be easily felt

through the abdominal wall. If cystic degeneration has occurred, spurious or true fluctuation may be present; but absence of the symptoms will not be proof that cystic degeneration has not occurred.

Diagnosis.—Scarcely is it possible to name anything more difficult than the diagnosis of the very small fibro-myomata when many of the leading symptoms are absent. This is sure to be the case with subperitoneal growths, and the surgeon is left entirely to exploratory skill. If the tumor has retroverted or anteverted the uterus, and become at all prominent upon either surface, bimanual palpation with a finger in the vagina or rectum will usually determine its existence. With a finger in the vagina or bladder its existence on the anterior wall, especially if the patient be thin, will be generally easily determined. If the patient be fat, it will be necessary with the volsellum forceps to pull down the uterus, so that the finger in the rectum may be swept over the posterior surface of the uterus, or the sound may be well curved and made to drag the uterus well forward against the finger in the vagina or bladder. The tumor, if at all defined, will present an outline within which the tissue is harder than that of the normal uterus; if well defined, it will be easily recognized. Even at so early a date the uterine cavity is often found deeper than normal, and the uterus congested and abnormally heavy. When the tumor springs from the supravaginal portion of the cervix, it is readily felt through the vagina. But if it be from the posterior wall of the fundus, and of considerable size and firmly adherent in the cul-de-sac, a sound in the uterus may or may not enable the examiner to determine that the growth is or is not attached to the uterus, or, if it is so attached, that it is a myoma. The direction taken by the sound and the consistency of the growth are the questions to be considered. The round form and solid feel of the myoma will aid in differentiating it from a hæmatocele or ovarian cyst, but it is not possible to differentiate it from a solid tumor of the ovary which is adherent to the uterus. Twice I have seen the abdomen opened, once by Billroth and once by Mr. Lawson Tait, for supposed myoma of the uterus, to find the tumor a solid one of the ovary. The differentiation from a cyst is less difficult; its elasticity, its rare close connection with the uterus, and its softer feel, are patent points. But if doubt exist the aspirator-needle may be used. A few years ago I thus diagnosed an ovarian cyst which had been diagnosed a fibro-myoma, and for which the woman was taking muriate of ammonia. Dr. Thomas of New York subsequently removed the tumor, confirming my diagnosis. When the tumor is interstitial and very small it will be extremely difficult, if not impossible, to determine its presence.

The existence of some of the symptoms alphabetically tabulated may give good presumptive evidence; in addition, the uterus may

be deeper than normal, or it may be possible for one of unusual skill to determine by the aid of the sound that one wall of the uterus is thicker than the opposite wall or that a portion of the wall is more solid or thicker. If the tumor is small and in the anterior wall of the uterus, the canal will be so displaced backward that the direction taken by the sound will prove that the body felt is not the fundus of an anteflexed uterus (Fig. 166, *c*).

When the tumor has attained a considerable size and other symptoms are present, and the possibility of enlargement from pregnancy, chronic metritis, and subinvolution are differentiated, the case is not difficult to determine. But given a small interstitial fibro-myoma associated with chronic metritis or pregnancy, and the diagnosis may be impossible. Time alone will solve it. Should, however, in early pregnancy the fœtus be dead and the woman present an enlarged uterus, with irregular periods of bleeding, a constant leucorrhœa, or flow of disagreeable odor, the case may be mistaken for a fibro-myoma, interstitial or submucous, and nothing except dilatation of the cervix and exploration with the finger will make a diagnosis possible. In chronic metritis the uterus is more or less tender; its walls are flat and soft; the os open, and frequently nausea exists. In cases of fibro-myoma the uterus is rarely sensitive, and especially when the growth is interstitial or subperitoneal, the body as well as the cervix is hard, and the os normal. If chronic cellulitis with extensive deposits be encountered, the uterus is fixed, while the reverse is usually the fact when the symptoms depend on a neoplasm. In early pregnancy the cervix and lower segment of the uterus are softer and the os more patent than normal; while in cases of fibro-myoma the cervix and os usually remain unchanged and the tumor is hard.

Further, in bimanual palpation the pregnant uterus will be found soft or elastic, symmetrical, and nearly in the central line; in cases of even small fibro-myoma it will be hard, inelastic, and usually misplaced. In small submucous neoplasms the bleeding is usually so prominent a symptom that the introduction of a sound or dilatation of the cervix and introduction of a finger will suggest themselves as the speediest way to decide the diagnosis. Having excluded pregnancy, and no tenderness existing in two cases of suspected neoplasm, I introduced a strong curette and broke off the pedicle; in both cases the polypus was expelled on the following day, the cases giving me no more trouble. In a submucous growth, with the cervix dilated sufficiently to admit the finger, the diagnosis should not be difficult. When the tumor grows from the intravaginal portion of the cervix, if interstitial its early symptom is simply an enlarged lip; but later its solidity, freedom from tenderness, its circumscribed hardness, and the absence of the evidence of malignant disease will warrant an

incision into the lip and an enucleation of the growth at the same time that the diagnosis is made. When the small interstitial fibroid is low down, its development toward the os externum enlarges the lip beneath it and protrudes it forward into the vagina. The opposite lip is spread out and the os loses its form, becomes a slit, and may be very difficult to find. When the neoplasm is entirely in the cervix the same difficulty will occur. The liability of mistaking such cases for inversion of the uterus is to be guarded against. A retroflexed or anteflexed uterus has frequently been taken for a fibro-myoma. The groove presenting to the examining finger between the neck and the fundus misleads; but the sound and bimanual examination will determine whether the round body felt is the fundus or a fibro-myoma. If the neoplasm arise from the posterior wall, the uterus is retroverted, and the bimanual method of examination will enable us to trace its close connection with the uterus unless the pedicle be unusually long. If, however, the uterus and tumor fill the pelvis, the patient should be placed in the knee-chest position, or, better, in Sims' position, with the side of the table elevated. The uterus and the tumor may now be pushed upward and forward out of the pelvis. A sound may then be introduced into the uterus and held with the thumb and fore finger of the right hand; the left hand, passing over the patient's hip, can grasp both uterus and tumor, and their connection may be determined by the movements of the sound. If the tumor can be grasped separately and moved without affecting the position of the uterus, it cannot be uterine; but if its movements as determined by the sound do affect the position of the uterus, it is attached to the uterus and probably of uterine origin. In thin subjects especially the sound may not be required; but bimanual examination with two fingers behind the cervix will enable the examiner to determine a close connection between the tumor and the uterus, or decide whether or not the tumor and uterus move together. But as it is the early development of fibro-myomata that will always give the cases most difficult of diagnosis, a more lengthy examination of this subject will be required. A case or cases presenting in which no change in the os or cervix has occurred, with no displacement, either retro- or anteversion or prolapsus, with or without much increase of the depth of the uterine cavity, with no marked elevation of either uterine wall to be felt bimanually, but with disordered, painful menstruation or irregular discharges of mucus or blood or the watery discharge of serum, will try the skill of the best diagnostician, and frequently compel him to summon time to his assistance. These symptoms, however, should always put us on the alert. All growths of this nature are at first supposed to be interstitial, but if they are not or become submucous the leading clinical features of the case will be disordered menstruation, bloody dis-

charges at irregular periods, and the presence of leucorrhœa consisting of mucus more or less watery. If, however, the tumor be developing toward the peritoneal coat of the uterus, these symptoms may be entirely wanting, and pain usually present between the periods, and especially severe at the periods, may be the only symptom present. Meadows has observed that the location of the pain is much determined by the location of the growth. "If the pain is felt in the lower dorsal or upper lumbar region, then it is probable that the tumor is growing on the fundus uteri. If, on the other hand, the tumor is more confined to the body of the uterus, then the pain will be felt in the lumbar region above; and, lastly, if the cervix be the seat of the disease, the pain will be felt mostly over the sacral region." Pain due to ovarian disease, like the neoplasms of the ovary, is to one or the other side of the central line; due to uterine neoplasm, it is in the central line. Small ovarian neoplasms are not always accompanied by menstrual disorders and irregular discharges. Where the tumor is subperitoneal, and pain and displacement alone point out a suspicion of its presence, we must wait until further development occurs. Later, the tumor may be made out, and the differential diagnosis from chronic metritis and pelvic cellulitis may be at once determined by the absence of sensitiveness to the touch of the finger; hæmatocele may be ruled out by the absence from the history of its sudden invasion with symptoms of shock: the slow growth of the tumor, its irregularity and solidity, are characteristic of fibro-myomata. Should, however, amenorrhœa be present, the density of the tumor, and possibly its irregularity, the asymmetrical condition of the tumor and the uterus together, the deviation of the uterus from the central line, the absence of changes in the mammary glands, the presence of a serous leucorrhœa of a peculiar odor, will usually lead to a correct diagnosis. Supposing the tumor and the uterus to be still in the pelvis, the uterus will be crowded to one side; or, if pulled down by the descending tumor, it will be retroverted, while the cervix is crowded forward; or, if the tumor proceed from the anterior wall, the uterus will lie retroverted beneath or to one side of the tumor. If the tumor has become so large as to lie above the pelvis in the cavity of the abdomen, the uterus will be dragged up and its cavity lengthened. While the tumor occupies the pelvis the pressure is extended to the bladder and rectum, and both retention of urine and difficult defecation are frequent. The ureters may also be so interfered with by the presence of the tumor and uterus as to convey a diminished amount of urine to the bladder: with this condition I have seen almost complete suppression of urine, but after the tumor was lifted out of the pelvis the flow of urine became greater than normal for a day or two. The presence of free fluid in the cavity of the abdomen is not very frequent, but when

it does occur by reason of the presence of the tumor, it may come from irritation of the peritoneum or from the tumor itself, the soft or œdematous variety. Adhesions are the result of partial or general peritonitis, usually the former when a fibro-myoma occupies the pelvis: it is important to guard the patient against these attacks, for if adhesions take place the tumor will be bound down firmly in the pelvis and all the symptoms resulting from such incarceration will follow. The mechanical irritation of the tumor produces peritonitis, which may involve that portion of peritoneum covering the tubes, and the adhesions which follow may shut off the canal of the tube; or the pressure of the tumor may shut off the uterine canal and sterility result; or the irritation of the tumor may produce so much congestion of the uterus as to set up the condition known as chronic metritis—viz. congestion with hyperplasia. When this is the case the symptom of pain is much increased, and bleeding will occur.

It is not uncommon at the menstrual period to find the tumors and uterus more enlarged than ordinarily, and I have a case now in which at these times there has frequently been retention of urine requiring the catheter. We may recapitulate the symptoms of the solid, subserous fibro-myomata thus:

A. Uterine displacement;
B. Pressure upon or irritability of the bladder and rectum;
C. Bearing-down pain and backache;
D. Uterine tenesmus at the menstrual period;
E. Serous leucorrhœa with or without peculiar odor;
F. Pressure on the crural nerves and blood-vessels;
G. Increased depth of the uterine canal;
H. Occasional retention of urine;
I. Sterility;
J. A solid, non-sensitive tumor;
K. Mobility of the tumor and uterus together;
L. Ascitic fluid in the abdominal cavity.

Of these symptoms, nearly all will be found in those cases where the growth nearly fills the pelvis, and nearly all of them will be wanting if the growth is too large to enter the pelvis, and therefore lies above it. In one case the patient may be suffering from nervous irritability and a disorder of all her functions to a considerable extent; she may be confined to her room, locomotion being painful. In another case, the pelvis being but little encroached upon or entirely empty, the patient may have no symptom of suffering and enjoy tolerably good health. When the tumor and uterus are above the true pelvis in the cavity of the abdomen their connection is usually easily determined by bimanual

examination without the aid of the sound. If cystic degeneration has occurred, palpation may detect it, and aspiration will produce a fluid having in it the fibre-cell or a fluid coagulating on exposure to the air, or blood alone may be drawn. The cavity of the uterus will likely be found lengthened, and the connection between the tumor and the uterus may be determined by seizing the latter with a volsellum forceps while an assistant seizes the tumor; alternate pulls by each other will determine a connection with the uterus, but it will not determine positively that the tumor has not had another origin and formed a uterine attachment. In such cases the proper method of diagnosis is by an exploratory incision.

Interstitial Fibro-myoma, Solid Variety.—As in the case of the subserous variety, the earliest symptoms will be uterine displacement with vague symptoms of but little certainty. As the tumor increases, if in the anterior wall, anteflexion at first, and later retroflexion, will occur. If in the posterior wall or at the fundus, retroversion will soon follow. The uterus in all varieties, by increased weight, partly due to the growth and partly to increased blood-supply, will descend to some extent. As the tumor grows dysmenorrhœa, menorrhagia, and leucorrhœa develop.

The irritation of the growth hastens uterine tenesmus, and that organ, becoming congested and heavy, sags down in the pelvis. As the tumor is increased the uterine canal is pressed upon; the symptoms of pelvic engorgement spoken of in the last section occur, and continue until the tumor and uterus, by reason of their size, are lifted up out of the pelvis. The introduction of a sound, or, better, bimanual examination, proves the growth to be the uterus enlarged by the tumor. Disordered blood-flow from the uterus and leucorrhœa more or less serous are the other symptoms most generally encountered.

Fibro-myoma of the Cervix.—Here the symptoms differ from the others in this, that menorrhagia is not so frequent, endocervicitis is more common, and the enlarging lip of the uterus is in sight if a speculum be used, and within easy reach of the finger. The differential diagnosis involves the malignant growths of the cervix, hyperplasia of the cervix following laceration, and inversion of the uterus. The tumor, if pedunculated, may be traced to its connection with the uterus. The consistency of the growth, its want of sensibility, the inability to separate it from the uterus by bimanual examination, the difficulty of finding the os, the fact that it has lost its normal or usual contour, the slow growth of the tumor, the presence of the uterine fundus beyond, the absence of all cachexia, the fact that the growth is of sufficient size to impact the pelvis, will clear up the case. Should it be deemed necessary, however, an incision into the growth, under proper and careful preparations, can be safely made and its nature fully diagnosed. Should

the tumor prove to be the uterus itself, in the hands of a good surgeon no injury would result.

Submucous Fibro-myoma.—The inception of this variety may be early followed by dysmenorrhœa, menorrhagia, metrorrhagia, leucorrhœa, and serous discharge, uterine tenesmus, and displacement, the symptoms steadily increasing with the growth of the tumor. Occasionally menorrhagia and metrorrhagia are wanting. The uterus enlarges, its cavity increases in depth, and its walls become heavier, and because of increment in weight it sinks in the pelvis. Sterility is always present, while in the subserous and interstitial varieties pregnancy may occur. Anæmia, neurasthenia, dyspepsia, great depression of spirits, and prostration often rapidly follow, and unless the patient is relieved of the tumor, either by nature or her physician, she will surely die. Should the patient not get rid of the tumor early, it may so enlarge the uterus by its growth that the former is lifted out of the true pelvis, and may, despite the symptoms, enlarge to any extent, bearing a ratio to the patient's powers of sustaining life.

General Remarks.—Solid fibro-myomata are readily differentiated from ovarian cystomata and fluid accumulations in the cellular tissue of the pelvis by the entire absence of fluctuation, their slow growth, their connection with the uterus, and the marked derangements of the functions of that organ. From solid tumors of the ovary it is not always possible to differentiate them, and, as already noted, I have seen both Billroth and Lawson Tait open the abdomen for a supposed uterine tumor and find instead a solid ovarian tumor. The moving about of the solid ovarian growth may move the uterus, and give the idea of a uterine tumor with a long pedicle. The most difficult diagnosis is encountered in very small subserous and interstitial tumors. But time or the bimanual method of examination carefully employed, or pulling down the uterus with a volsellum and retroverting it toward the examining finger in the vagina or rectum, will sooner or later discover the small growth. If it be subperitoneal and located on the anterior wall, and producing symptoms of stone in the bladder, I see no objection to dilating the urethra, dragging down the uterus, passing the finger into the bladder, and examining both bladder and the anterior wall at the same time; or, if there be no other way and the case is urgent, the bladder may be opened as if for drainage, and the finger introduced and passed along the anterior wall of the uterus. The interior of the uterus may be reached with the finger only after thorough dilatation, which may be accomplished with Molesworth's dilator or the metallic dilator of Marion Sims or Dr. Wilson, either after or before division of the vaginal portion of the cervix.

Previous to entering upon either of the above-described processes the bowels should be completely cleaned out, and all pelvic congestion

further relieved with the hot-water douche, and the last may be continued as a safeguard after the procedure. Both anteflexion and retroflexion of the uterus have been mistaken for fibro-myoma. The uterine probe will locate the position of the fundus in either case, and careful manual palpation will further solve the problem. Fecal accumulations in the caput colli or sigmoid flexure would not follow the movements of the uterus, and would be affected by enemata and cathartics. Pelvic hæmatocele is of sudden appearance, accompanied by evidence of loss of blood; the tumor is fixed and painful to the touch. Pelvic cellulitis produces a painful swelling which soon fixes the uterus, rendering efforts to move it painful; the temperature rises and examinations are painful; the vagina is hot and the pulse beats perceptibly in the vaginal arteries.

These constitute the main clinical features, differential and otherwise, of solid fibro-myomata of the uterus.

Caution.—The uterine sound as an aid to diagnosis is beyond doubt valuable. Its use is entirely precluded in case pregnancy exists. It should be used with the utmost care and without the exercise of any force. The direction of the uterine canal should be first determined by means of a flexible silver probe, which may also be used as a substitute for the sound. In early experience I was in the habit of using the sound, but later the probe, and for several years have used neither. An extensive experience in bimanual examination will enable any one to dispense with the use of many instruments with advantage.

Prognosis.—These tumors frequently cause death. Relatively, they are innoxious in the following order: subperitoneal, interstitial, cervical, and submucous. The last is probably the most dangerous, for it is almost always accompanied with great loss of blood; even a very small tumor may cause fatal bleeding. Yet, although many of these tumors are, as a rule, not dangerous to life, they are liable at any time to cystic degeneration and to set up a train of evils demanding an entirely different consideration. The tumors occasionally disappear, as already stated, after the menopause or pregnancy. In fact, this is their natural history. When submucous they are frequently expelled through the vagina as polypi. When the capsule ruptures under expulsive effort, they escape in mass or break down and are expelled piecemeal; ulceration of the capsule from any cause favors such a result. Nevertheless, these tumors occasionally destroy the patient through the advent of suppuration or necrosis of the tumor, producing septic poisoning, or uræmic poisoning may occur from pressure upon the ureters; fatal peritonitis may result from the irritation of the tumor; or a fatal hemorrhage may ensue; or the long continuance of discharges may exhaust the patient; or their continued pressure upon the nerves and ganglia

may finally wear out the stoutest nervous system. The symptoms are so liable to change from year to year that a guarded prognosis is wise.

Fibro-cystic Myoma.

As already intimated, the foundation of every fibro-cystic myoma is a solid fibro-myoma, either uninodular or multinodular. The latter undergoes cystic degeneration to produce the former. The fluids formed in these tumors consist largely of serum, mucus, blood, fat, or lymph, and occasionally pus, and are not confined in true cyst-cavities. The tumor may be infiltrated with serum to such an extent as to give a palpation so like fluctuation that even after the tumor is removed it is difficult to believe that it is not a cyst. The serum is contained in innumerable small spaces formed by spreading the meshes enclosed in the fibrous tissue. When the lymphatics entering the tumor or passing between the centres of the multinodular variety dilate, the fluid accumulates often in a large quantity ("fibro-myoma lymphangiectodes" of Virchow). This fluid coagulates on exposure to the air. The formation of mucus in these tumors is more difficult to account for. This form of degeneration does occur and a fluid rich in mucin accumulates. No mucous glands are found, and it is possible that the fluid is the result of a "mucous metamorphosis" of the protoplasm or a separation of the fluid by independent cell-action. The presence of blood in the tumor is not so difficult to understand when we remember that occasionally large vascular sinuses penetrate these tumors, and an apoplectic condition, with subsequent clot, disintegration, and softening of the adjoining structure, may occur. Fatty degeneration and consequent softening have already been spoken of at length. Suppuration in these tumors, though rare, does occur. Recently, by post-mortem, I removed an enormous one, and it contained pus as well as other fluids. The subperitoneal and interstitial varieties are most prone to softening, while the submucous variety is not exempt from it. The tendency in these tumors, where the softening arises from infiltration with serum, fat, or blood, is toward enlargement, but subsequent absorption of fatty softening occurs and tends to recovery. The enlargement from serous or apoplectic infiltration is not of definite limit and may not always endanger life. The enlargement from mucous degeneration and the accumulation of lymph seems to produce the tumors, which advance steadily in growth until the life of the patient is jeopardized and extirpation is no longer a matter of choice. The rule, however, may be laid down that any fibro-myoma which gives evidence of fluctuation and progression should be removed without delay.

Diagnosis.—The diagnosis of these tumors presents always a question of origin. It also involves the rules of differentiation to be

observed in the diagnosis of ovarian cysts. In the latter the uterus is found displaced downward and backward or forward; in the fibro-cystic uterine myomata, if large, the uterus is dragged upward; often the uterine cavity is lengthened, and a sound introduced into it will, when the tumor is moved about, move also, proving the connection between the tumor and the uterus. The tumor must be differentiated from pregnancy, but occasionally these patients are beyond the childbearing period. The shape, size, duration of the tumor, and effect on the health of the patient are important points. The history of the case pointing to the prior existence of a uterine tumor, and the age of the patient, not usually more than thirty-five years, are vital points. The question may be positively settled by the aspirator-needle, which will emit fluid having microscopically characteristics entirely different from those found in ovarian cysts. Free fluid in the cavity of the abdomen is more frequently found than in the case of ovarian cysts, and by reason of the greater solidity aortic pulsation is probably more frequent. Even if the patient be within the menstruating age, menorrhagia would not likely be met with in ovarian tumors. Unlike ovarian tumors, fibro-cysts are not met with in patients under thirty-five years of age. They grow very slowly, and the general health of the patient sympathizes with their presence at a later date. The expression of countenance and the emaciation seen in large ovarian tumors are quite different. The face is often florid even when the tumor is large, and does not betoken the great danger of the patient. The emaciation comes on later than in ovarian tumors. Elasticity in the tumor may precede fluctuation. The varicose condition of the abdominal veins is rare in these cases, but frequent in ovarian cystomata. Aspiration of these tumors, in which the cysts are supposed to arise from obstruction of the lymphatic vessels, gives a fluid limpid, yellow, and fibrinous as lymph, which coagulates as it flows into the basin. But when aspirated the cysts produced by œdematous infiltration give a fluid yellow and serous which does not coagulate when exposed to the air. The fluid of this variety may be tinged with blood; if, however, much blood is drawn from such a tumor, it may be from having opened a blood-sinus, such as Virchow describes as having met within them. Coagulability of the fluid was long ago described by Dr. W. L. Atlee as diagnostic of the fibro-cystic myoma. In the fluid drawn from the œdematous variety the fluid microscopically presents nothing more than the ordinary constituents of fibrinous serum. The walls of a uterine fibro-cystic myoma are darker and more vascular than those of ovarian cysts. The uterine muscular fibre in the interstitial variety composes the cyst-wall, and uterine sinuses are the blood-channels. The adhesions formed by these tumors are often immense—broad bands of tissue, often very vascular; large plexuses of immensely-

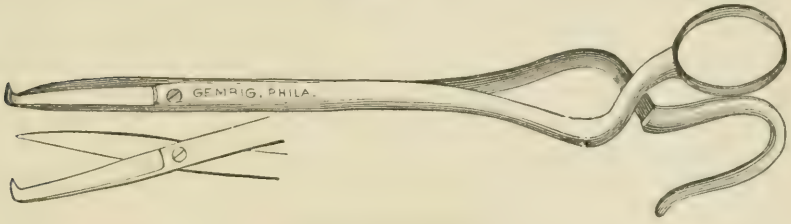
dilated mesenteric veins are seen adhering to the tumor, and occasionally the broad ligaments and tubes are spread out upon their walls like great vascular wings. The bladder is often adherent to the front of the tumor and dragged high up on the abdominal wall.

Medical Treatment.—Medically, but little can be done for the relief of patients suffering from fibro-myomata, and nothing for those suffering from those tumors which have undergone cystic degeneration. Many remedies have been given for the cure of solid tumors of the uterus; prominent among these is ergot and its preparations. Hildebrandt established its use hypodermically, and reported favorable results. I have tried it with many others, and have arrived at the following conclusions with reference to it: Given by the mouth, rectum, or hypodermically in large doses, it is an excellent remedy for the relief of the hemorrhages. In one case in which I gave one hundred and five consecutive hypodermic injections, it condensed the uterus and arrested the growth of the tumor. This tumor was subperitoneal. Few patients can endure a sufficiently large number of injections to do them any good. The deeper into the cellular tissue and fat the fluid is injected, the less pain and danger of subsequent inflammation and suppuration. I never saw it produce a cure. Professor Byford of Chicago relies on it in very large and frequent doses to expel the submucous and polypoid variety of the tumor, and his experience thus far is good, In addition to ergot, bromide and iodide of potassium, chloride of calcium, arsenic, and phosphorus have been largely used; the same may be said of chloride of ammonium. I have used all extensively, except the chloride of calcium, and have seen no cure result in a single case. If the physician can keep the tumor out of the small pelvis, relieve rectal and vesical irritation and congestion by resorting to elevation of the tumor and uterus by the knee-chest position daily and by copious douches of hot water, in some cases he will afford great relief, diminish the hemorrhage, and nurse his patient beyond the menopause or keep her in better condition to bear surgical treatment. Thus I nursed one patient sixteen consecutive years, keeping her fairly comfortable. She has now ceased to menstruate and her tumor is becoming smaller very slowly.

Surgical Means.—As Ephraim McDowell of Kentucky secured for American surgery the honor of establishing ovariotomy, so the late Washington L. Atlee inaugurated, by the publication of a paper entitled *The Surgical Treatment of Certain Fibrous Tumors of the Uterus* in 1853, a pioneer movement in the treatment of fibro-myomata which is still advancing. So truly is this the fact that Professor Thomas wrote in 1880: "With the means at present at our command all the variety of fibroids, the submucous, interstitial, and subserous, are amenable to extirpation." There are but two routes by which these

solid uterine tumors can be removed—either through the vagina or by laparotomy; with the exception of small tumors with a well-defined pedicle all supraperitoneal fibro-myomata are reached only by section of the abdominal wall. I have once divided the posterior wall of the vagina, and through this opening delivered the tumor. I saw Martin of Berlin also open the peritoneal sac in removing, per vaginam, a small

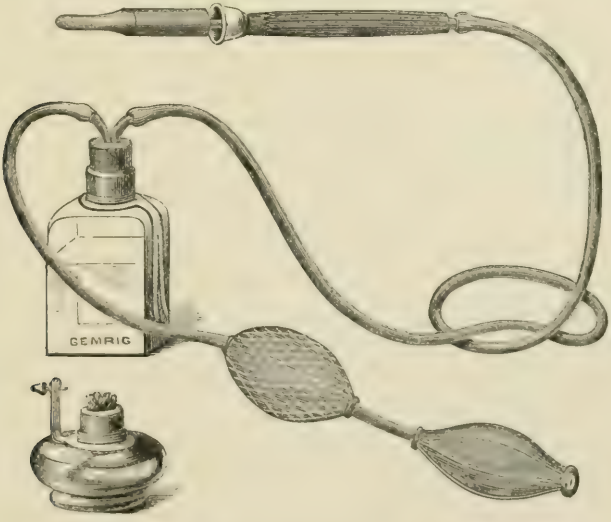
Fig. 167.



Kuchenmeister's Scissors.

subserous growth standing at the vaginal junction. The tumors properly removed through the vagina are polypoid, submucous, and interstitial. If the cervix has been dilated from within out by the pressure of the tumor, and it remains only to dilate the os externum, the avenue

Fig. 168.



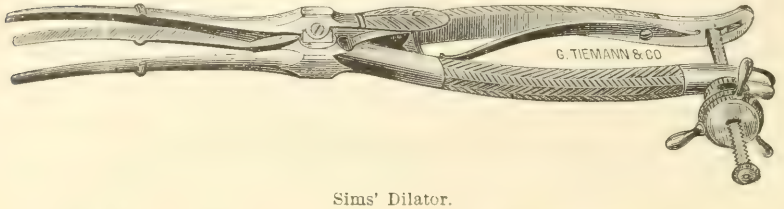
Paquelin's Cautery.

to the tumor is easily made patent. But if the cervix is undilated in its entire length, means must be employed with proper precautions and care to dilate it. The bowels should be cleared out and local congestion relieved by frequent douches of hot water. The cervix may now be

divided, as far as the vaginal junction, with the scissors (Fig. 167), as Meadows has advised, or with the Paquelin cautery-knife (Fig. 168) still higher, as Professor Thomas advises. Immediately or after a week of delay, the patient's condition having been still further improved by appropriate treatment, we may proceed to dilate the now shortened and weakened cervix. If the growth seems free to advance, ergot may be given until the canal is sufficiently open to admit an instrument, with which the growth is seized, and traction should be made to assist the uterus to expel it. The importance of traction in the delivery of these tumors was insisted on by Dr. Thomas Addis Emmet years ago. If, however, the tumor is not free in the uterine cavity, it may project sufficiently to enable the operator to sink a double tenaculum into it, and still assist its final delivery by traction. If, however, it is necessary to provide for easier access to the cavity of the uterus, we must select means to effect it.

If the tissues are tolerably soft, we may proceed at once, under an anæs-

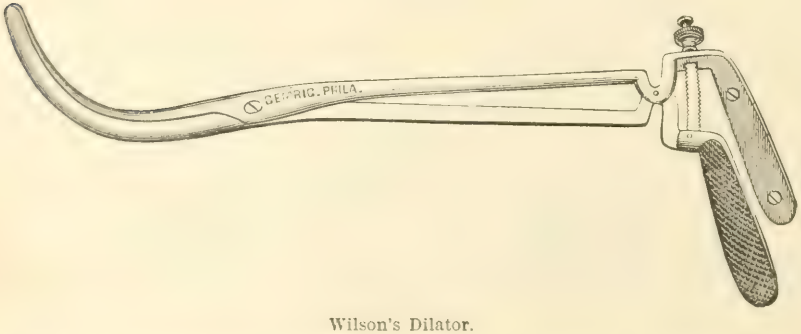
FIG. 169.



Sims' Dilator.

thetic, with Marion Sims' (Fig. 169) or Dr. Wilson's large metallic dilator (Fig. 170) or Molesworth's hydrostatic dilator (see Vol. I. Fig. 134),

FIG. 170.

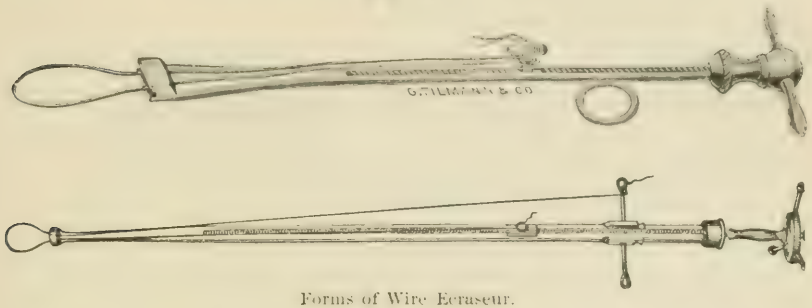


Wilson's Dilator.

with a fair prospect of success. If, however, resistance is well marked, more gradual dilatation, with tupelo or laminaria or sponge-tents, carefully made antiseptic with carbolic acid and finally smeared with iodoform paste, should be substituted. The avenue once open, it should be

thoroughly disinfected: the subsequent steps will depend on the location of the growth and its attachments to the uterus. If it be pedunculate, it should be seized with strong forceps and an attempt made to secure its pedicle with the wire loop of the écraseur (Fig. 171) or the

Fig. 171.



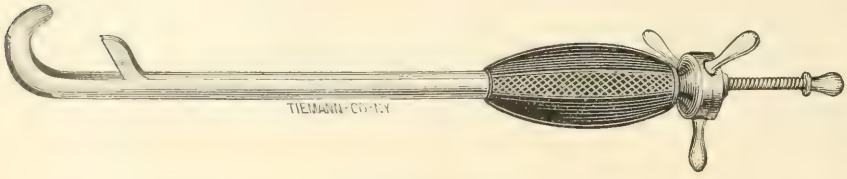
Forms of Wire Ecraseur.

galvanic caustic wire, with the former of which it may be crushed off or with the latter burnt off; with the polyptome of Aveling or Sims the pedicle may be divided. Or it may be twisted off if the pedicle be slender. Once the pedicle is divided, it is delivered by traction, unless it be too large, when it must be reduced by cutting pieces out of it, or, as Emmet has advised, by making incisions into it in a spiral direction as the tumor is pulled down. If in the effort the uterus be inverted, reposition should be made immediately after removing the tumor. If, however, by traction upon the tumor with its uterine attachments unsevered the uterus is inverted, care should be taken not to cut off the pedicle with a sharp instrument, but with blunt scissors or with Paquelin's cautery, or, if possible, to separate the growth by enucleation. This precaution should be observed as a guard against subsequent bleeding after reposition of the uterus has been made. After dilatation of the cervix polypoid growths may be twisted off, or if their pedicles be sufficiently long to permit, the tumor may be dragged into the vagina, where the pedicle may be dealt with by means of the wire écraseur, blunt curved scissors, or the galvano-caustic wire; and in cases of multipara it may be easy to secure the pedicle with a ligature, and below it cut off the growth with any sharp instrument convenient. When the polypus is in the vagina, if not too large, a Sims speculum (see Vol. I. Fig. 121) may be slipped in and greatly expedite its removal. In cases of short pedicle, in addition to the means already spoken of, the polyptome of Aveling (Fig. 172) may be used to divide it, or the pedicle may be torn across with a stout curette or spoon saw.

When the cervix is dilated and the tumor found to have a broad attachment to the uterus or to be well imbedded none of these procedures will avail anything, and the operator will now meet with real

difficulty. The object he must now attain is a method to open the capsule of the tumor. Before proceeding to this, however, he should weigh well the propriety of abandoning the attempt by the vagina for a subsequent removal of the ovaries and tubes after the method of Mr. Law-

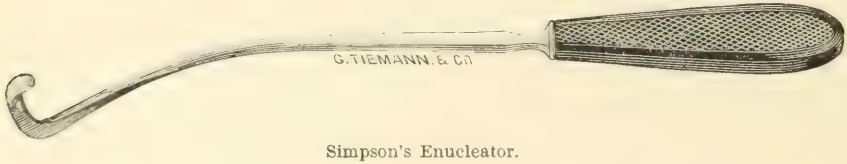
FIG. 172.



Aveling's Polyptome.

son Tait. If, however, he elects the more difficult and scarcely less dangerous method of enucleation, he will proceed somewhat as follows: The patient, well anæsthetized, is placed on her back, and an assistant forces the uterus well down toward the vaginal outlet. The operator now passes a finger into the uterus and locates the growth. Having done this, guiding a knife, a probe-pointed bistoury, or a pair of scissors on his fingers to a point selected, he cuts through the capsule by as free an incision as possible. With the finger and enucleator of Simpson (Fig. 173) or of Sims (Fig. 174), or with Thomas' spoon-saw

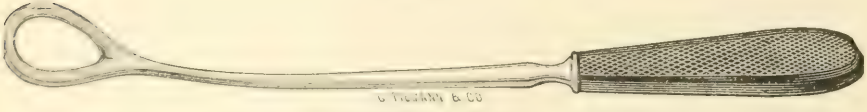
FIG. 173.



Simpson's Enucleator.

(Fig. 175), he peels back the capsule, separating the tumor from its attachments as far as possible. At this juncture he may desist and

FIG. 174.

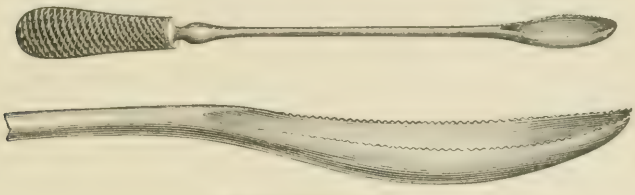


Sims' Sharp Curette.

give ergot—a dangerous experiment—for the tumor, now largely cut off from its base of supplies, will probably slough and poison his patient. It is better to proceed, and with strong volsellum forceps or Sims' large tumor-hook (Fig. 176) drag the tumor into the vagina, or, if it be too large, cut pieces out of it or cut into it spiral incisions as it comes into the open cervix under strong traction. The fact that

it is not every fibro-myoma that can be shelled out of its capsule makes it possible to leave behind, either in avulsion or enucleation, pieces of the tumor; these may subsequently slough and poison the patient. The dangers by this method are sometimes scarcely less than hysterectomy, and greater than Tait's operation. When the tumors are of moderate

Fig. 175.



Thomas' spoon-saw.

size this method promises best, but if the tumor and uterus reach quite to the umbilicus, I would certainly prefer Tait's operation, notwithstanding I have succeeded thus in enucleating very large tumors.

Simple division of the capsule or capsule and cervix with the guarded knife or Paquelin's cautery-knife, and the subsequent free administra-

Fig. 176.

Sims' Tumor-hook.

tion of ergot, may be tried in almost any case, and if the growth is once started from its bed traction will give great aid. Prompt delivery is the only safeguard against septic poisoning. In skilful hands the spoon-saw of Thomas is the most effective of all instruments for the immediate enucleation of the tumor. After the removal of the growth the uterus should be frequently washed out with hot water containing a disinfectant in solution. The surgical treatment of hemorrhage occurring in cases of interstitial and submucous fibro-myomata, prior to the removal of the ovaries and Fallopian tubes, by Mr. Lawson Tait, was confined to division of the cervix uteri and division of the capsule of the tumor, or division of both capsule and cervix at the same time. In division of the capsule the divided blood-vessels retract and become occluded. Why division of the cervix sometimes controls the hemorrhage I cannot explain, but from personal experience I know it does it.

Removal of the ovaries or of ovaries and tubes holds out the greatest promise. After the establishment of the menopause these tumors atrophy by reason of fatty degeneration. The removal of the ovaries or ovaries

and tubes establishes the menopause. Possibly it does more. Removal of the ovaries and tubes is now the established procedure. Mr. Lawson Tait found a monthly bleeding persist after Battey's operation, oöphorectomy, and subsequently included the tubes in his operation. His experience and that of others is that the operation not only arrests the hemorrhage, but that the growth is also arrested, and in many cases disappears in from six to twenty-four months. He considers the time necessary to get the full effect of the operation to be two years. If cystic degeneration has occurred or the growth is malignant the operation does no good. It is to cases of small non-cystic fibro-myomata that the operation is best applicable.

Tait's Operation—the Removal of Ovaries and Tubes.—His manner of doing his operation is as follows: The abdominal wall is opened by an incision in the median line above the pelvic symphysis. When the peritoneum is reached, he controls all bleeding in the wound with ordinary hæmostatic forceps. Picking up the peritoneum with a pair of forceps, he makes a small opening in it. Through this he introduces one finger, dilates or tears the peritoneum, and passes in a second finger; with these he explores the pelvis for the ovary, first on the left side; if adhesions exist, he tears them up with the fingers if possible, and brings through the wound the ovary and tube, and holds them with his thumb and fingers as you would a fold of your handkerchief. Through the broad ligament below the fingers, and of course under the tube, he passes a long-handled needle, with an eye near the point, armed with a strong silk ligature, its middle point resting in the needle's eye. He now drops the handle of the needle on the abdomen, and slips his right index finger in between the ligature and the shaft of the needle, and draws the double ligature farther through toward his assistant, who seizes it. He then withdraws the needle. Taking hold of the loop, he carries it over the ovary and tube and places it between the free ends of the ligature, and, winding them round his right hand, draws firmly upon them, and the ovary and tube are at once constricted with a double noose which cannot slip. The following wood-cut (Fig. 177) illustrates this knot, known as the "Staffordshire knot." He now seizes the pedicle with a pair or two of hæmostatic forceps to prevent its escape, and a short distance above the ligature cuts the ovary and tube away. Observing that it is secure, he proceeds to treat the right ovary and tube in a similar manner. After carefully cleaning the peritoneal cavity of all blood he closes it. (For further information on this subject I refer the reader to Mr. Tait's late work on ovariotomy. During the three months I spent with Mr. Tait he operated on account of existing

Fig. 177.

Staffordshire Knot.

myoma three times, but for other complications was removing the ovaries and tubes constantly.) The organs were nearly always plainly pathological.

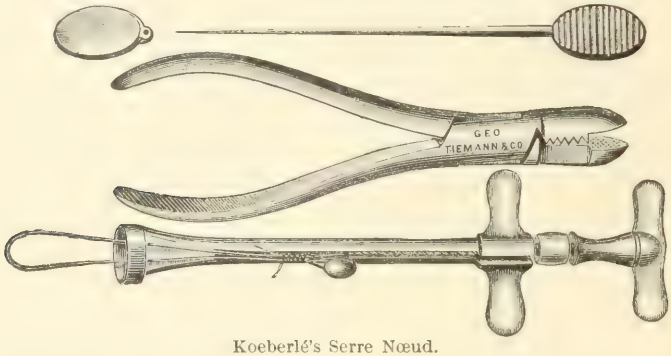
The operation of Mr. Tait, the removal of both ovaries and tubes, is applicable more especially to cases of small or medium-sized interstitial and subperitoneal tumors. When the tumor has become so large as to drag the uterus up and lengthen the cervix sufficiently to make a pedicle of it, supravaginal hysterectomy becomes a feasible and easy operation. Two methods of supravaginal hysterectomy are practised across the Atlantic. One method is characterized by the extra-peritoneal mode of treating the pedicle, and is practised by Dr. Keith, Dr. Bantock, Mr. Lawson Tait, and Péan. The second method is characterized by the intra-peritoneal manner of treating the pedicle, and is followed by Professor von Billroth, Dr. Koeberlé, Schroeder, and Dr. Martin. A case illustrative of Dr. Keith's method: operation, May 3, 1882, by Dr. Thomas Keith, assisted by his son; patient, Miss ——, aged nineteen. Ether narcosis; spray 1 : 40 boroglyceride. Incision as long as possible between umbilicus and pubes; all vessels in the wound carefully ligated. Large globular uterus containing tumor turned out. Large warm sponges pushed into the abdomen in front of and behind the uterus. Warm carbolized compresses (folded towels) were laid over the wound, closely surrounding the neck of the uterus. A clamp was now placed round the neck of the uterus and the ovaries. An extra sponge or two were crowded close into the clamp, and with a knife the uterus was cut away above the clamp. Re-examination of the abdominal wound for bleeding points was now made, and several catgut ligatures were applied. The sponges were removed from the belly and the abdominal wound was closed down to the clamp. The top of the pedicle was now trimmed with the scissors, and small pledgets of carbolized gauze soaked in carbolized glycerin were carefully packed all round the clamp. The pedicle was mummified with a saturated solution of perchloride of iron in glycerin, and it was then covered with more gauze, which extended all over the entire wound. A roll of cotton and bandage completed the dressing. There was no shock, and the patient rapidly recovered.

Up to December 3, 1884, Dr. Keith had done 38 hysterectomies at the vaginal junction; of these 35 recovered and 3 died. Dr. Bantock, a most successful operator in London, operates much after the manner of Dr. Keith, now also in London, securing the pedicle with Koeberlé's "serre nœud" or wire-constrictor (Fig. 178). His results up to the spring of 1883, when I last saw him operate, were excellent, and they still continue to be better than those of any operator following the intra-peritoneal method of treating the pedicle. He uses dry thymol gauze to dress the pedicle, and does not mummify it. On January 31, 1883,

I saw him do hysterectomy for a lady for whom he had removed the ovaries and tubes April 8, 1881. The tumor had continued to grow. Mr. Lawson Tait constricts the pedicle with his own wire clamp.

Cases by Mr. Lawson Tait.—Operation June 30, 1882, assisted by

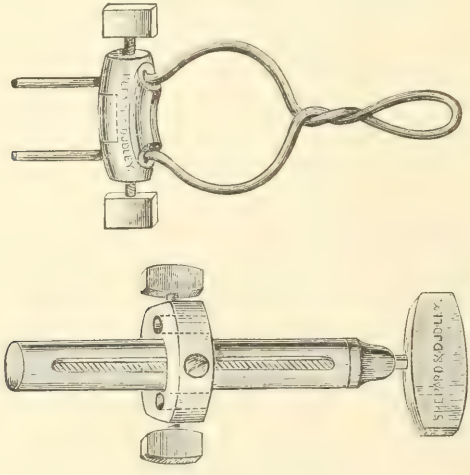
FIG. 178.



Koeberlé's Serre Nœud.

Mr. Raffles Harmer: Miss ——, a Jewess. Ether narcosis. Incision very long, extending from pubis far above umbilicus. After exposure of the tumor, which was highly vascular, an enormous plexus of veins from the mesentery were found attached and feeding the growth from

FIG. 179.



Tait's Wire Clamp.

above. These were tied with a coarse, uncarbolized silk ligature at two points, and between the ligatures the vessels were divided *en masse*. The tumor was now turned out, and the broad ligaments and tubes were discovered to be spread out over it like wings. An écraseur was armed with a strong cord like a cod-line, or coarser, and the loop was

carried over the tumor and uterus, for such was the mass, down to the neck, and everything within the grasp of the noose was tightly constricted. The whole thing—uterus, tumor, and ovaries—was cut away some two inches above the cord. His wire clamp (Fig. 179) was now adjusted, and more of the mass above it was cut away. The pedicle above the clamp was mummified with perchloride of iron, the cavity of the abdomen was well cleaned, and the wound closed. A dry dressing and roller of flannel completed the operation. The patient suffered severe shock, rallied, and made a good recovery. The tumor and uterus weighed thirty-eight pounds, and the tumor had undergone cystic degeneration. I subsequently saw him remove in the same manner another uterus and tumor weighing forty pounds; the patient died. These were the only large tumors of uterine origin he operated on during my stay of three months in Birmingham.

Péan of Paris and Hegar of Freiburg are the only operators I know of on the Continent who treat the pedicle extra-peritoneally in these cases. I saw Péan perform ovariotomy and other operations, but no hysterectomy. He penetrates the uterus near the os internum, or even lower if the tumor extend downward; wire sutures are drawn into place; the two halves of the cervix are compressed by twisting them, and the pedicle thus formed is fixed in the wound.

Hegar has attained, next to Keith, the best results in supravaginal hysterectomy. He treats the pedicle extra-peritoneally. The tumor is first lifted out of the cavity of the abdomen, and the pedicle is surrounded with Kleeberg's ligature. If the stump be very large, it is ligatured in halves. The mass is cut away above the ligature. The stump is fixed in the lower angle of the wound. Below the pedicle and just above it sutures are passed, uniting only the deeper structures in the wound, and the stitches adjacent to the uterus attach the peritoneum of the abdominal wall to the peritoneum of the stump, around which it is closely fixed. For the distance of two sutures above the stump the deeper structures only are united. Above this point the entire wound is united as usual. A space floored by peritoneum is thus left surrounding the stump. "The projecting end of the stump is thoroughly cauterized; the raw surfaces round it are painted with solution (3–10 per cent.) of chloride of zinc, and cotton wadding which has been soaked in a 2 per cent. solution of the chloride and then thoroughly dried is packed round the stump (Hart and Barbour). Finally, the end of the stump above is touched with a 100 per cent. solution. The whole is covered with protective silk and carbolized wool, and the antiseptic dressing laid on so that it can be easily lifted. The space around the stump is kept thoroughly dry by repeated dressings—three or four times daily, according to amount of discharge—with the chloride-of-zinc wool; the pedicle is pared away gradually with scissors to

diminish its size, to permit the chloride to act more thoroughly, and to prevent pus from burrowing. The elastic ligature is clipped away about the tenth day.

When these tumors contain fluid a trocar is employed as in ovariotomy, and if the tumor is too large to deliver through the incision, already long enough, the tumor is cut to pieces, the pedicle having been secured with an elastic ligature or the wire of the constrictor. The adhesions should be ligated with strong silk at two points, and division be made with the scissors or Paquelin's cautery. When these adhesions are heavy they should first be grooved for the distal ligature with strong lock-handled forceps applied with the full force of the hand. Should the bladder be adherent to the tumor in front, it should be dissected down. If intestinal adhesions exist, they should be very carefully tied off before division, and not rudely separated with the fingers, or a bit of the capsule of the tumor may be peeled off and doubled back on its raw surface and stitched along the border. Thus the intestinal adhesions are not disturbed.

The only remaining operator of celebrity of whom I have any knowledge who treats the pedicle extra-peritoneally is Prof. Thomas of New York. He applies a clamp as a safeguard during the operation. Subsequently, he passes a number of strong knitting-needles through the pedicle at right angles above the clamp to support the part after the clamp is loosened. "Then by large cautery-irons the tissue above the clamp and needles is thoroughly charred." The clamp is now loosened, but not removed, and is to stand guard against hemorrhages during the further progress of the case.

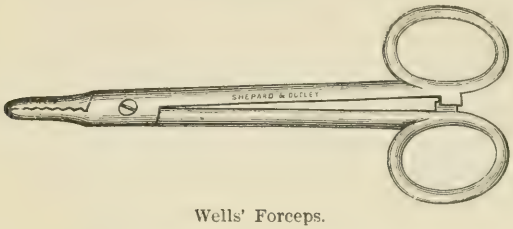
Intra-peritoneal Methods of Treating the Pedicle.—The success which has characterized ovariotomy since all operators have returned to the intra-peritoneal method of treating the pedicle has stimulated the operators on the continent of Europe to endeavor to discover a method whereby the stump of the uterus in supravaginal hysterectomy might be left within the peritoneal cavity. Promise of success is already apparent in the experience of Schroeder, Billroth, Koeberlé, and Hegar. Two points were to be attained:

1. To secure the patient against great loss of blood;

2. A method of forming a pedicle free from the danger of subsequent hemorrhage. The method of Professor von Billroth is to leave the stump in the cavity of the abdomen. Ligatures are placed on the blood-vessels as they pass through the uterine ligaments to the uterus. When the ligaments require division they are tied at two points and divided with Paquelin's cautery. The neck of the uterus is seized above the vaginal attachment with a pair of powerful lock-handled forceps (Fig. 180) and literally crushed. In fact, I have seen him bite the uterus entirely off with these forceps. In the deep crushed groove thus

made a double ligature is passed through the cervix; each half is firmly tied in the groove and the ligatures are cut short. Above this ligature the uterus is amputated; the sides of the stump are securely stitched together and the stump is dropped in. When the patient is anæmic or loss of blood is a vital point, he compresses the tumor and

Fig. 180.



Wells' Forceps.

uterus with an elastic bandage, after the manner of Dr. Leon Labbé, driving all the blood possible into her body. There is no return of blood to the tumor after the ligatures are tied to the cervix.

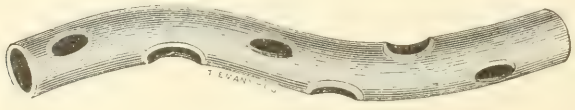
Koeberlé, who instituted the "serre nœud" used in the operation by Dr. Bantock, has abandoned it and leaves the stump of the uterus in the abdomen. Koeberlé told me that he was better satisfied with this than with his former method.

The method of operating pursued by Schroeder was also the intra-peritoneal. He aimed to operate with as little loss of blood as possible, and to secure the pedicle against subsequent bleeding. The first point he attained by means of the elastic ligature, devised by Kleeberg and first applied to the cervix uteri by Dr. A. Martin, placed temporarily around the supravaginal portion of the cervix uteri. If the tumor was a pedunculated, subserous one with a reasonably-sized pedicle, he tied it in halves and cut the tumor away. If the pedicle was short and thick, he cut it off close to the uterus; if interstitial, he cut the capsule and peeled out the tumor or cut a V-shaped piece out of the uterus. When the cut surface on the uterus was too flat to close with sutures, he hollowed it out. The wound in the uterus was then closed with several layers of carbolized silk sutures. The deep layers unite the uterine tissue. The last layer brings the peritoneum neatly over the wound. When the elastic ligature was removed no bleeding occurred. When possible he spared the uterus and its appendages. Tumors developing downward to the cervix and pushing the appendages upward present no pedicle upon which to apply the elastic ligature. In such cases he ligated at two points, and divided between the ligatures the opposing uterine ligaments and blood-vessels. This done on both sides, the tumor or tumors were separated from the surrounding tissues, and the elastic ligature was secured around the base at or above the vaginal junction. The uterus and tumor were now cut

away above the ligature. The open uterine canal was disinfected with a strong carbolic solution, the stump was hollowed out or made V shape, and united with several rows of silk sutures, the last uniting the peritoneum over the stump. A few deep sutures were placed at the sides, to catch, if possible, the points where the large vessels were divided. The elastic ligature was then removed. After a few moments' delay if any bleeding points appeared a few more stitches were put in to control them.

When the tumor has developed from the lower part of the uterus and extended into the cellular tissue, and risen upward, carrying the uterus with it so high that the os cannot be reached per vaginam, a case of the utmost gravity is presented. The surrounding ligaments and vessels are first double ligatured and divided. The elastic ligature is placed around the cervix, the uterus is amputated, and the tumor is shelled out of its bed. The stump of the uterus is treated as above described. The great cavity out of which the tumor was shelled may be left open, or closed, if possible, with sutures, and drained either by the abdominal wound or vagina (Fig. 181). Schroeder preferred the former route. When the bladder is adherent to the front of the

FIG. 181.



Drainage-tube.

tumor and carried high up, he extended the incision to a higher point, and then proceeded to enucleate the tumor from the posterior wall of the bladder. Before closing the abdominal wound the bladder and stump of the uterus were united. Martin operates by methods similar to those of Schroeder.

My own operations in laparotomy have thus far been after Schroeder's methods, learned by observing him operate in Berlin. My cases have been the most hopeless I could select, where it was death or operation: the tumors have been very large, but one being less than fifteen pounds, and in every case a pedicle had to be made, and in all but one there was left a great cavity in the cellular tissue of the pelvis. No case has been lost from secondary bleeding. One was lost from tetanus and one from septicæmia; some recovered. I have practised enucleation per vaginam many times, the tumors ranging in size from a walnut to greater than an adult head. Every case operated has recovered.

It is now apparent to the reader that through laparotomy there are three ways of dealing with uterine fibroids. These are:

1. Supravaginal hysterectomy;
2. Removal of the tumor, leaving the uterus;
3. Leaving the uterus and tumor and removing the uterine appendages.

Which method shall be selected? In fibro-cystic tumors entire removal is the only proper method, but such is not always the case with a solid tumor. In my own mind is fixed an axiom which is contrary to the views of many. It is this: *in cases in which a fibroid tumor can be enucleated per vaginam removal of the uterine appendages is an unjustifiable operation.* I feel sure from personal experience that it is not always necessary to unsex a woman because she has a fibroid tumor. My rule has been, if such a tumor was giving a woman no trouble, to let her alone; and I see no reason for changing that course. I am sure that I have not thus far operated on, by any method, more than one in thirty of the patients who have consulted me. When these tumors are favorably located they do not prevent or render especially hazardous the bearing of children, and they sometimes disappear with the involution of the uterus. Every case of fibroid tumor ought to be considered on its own merits, and no rule of surgical procedure should be applied to all cases, as in cases of ovarian cysts. It is very difficult to find general decisive principles regulating the indications for this operation. A woman may be bleeding to death, suffering pain from mechanical pressure, rendered an object of charity, be dying from nervous exhaustion, the result of her tumor, but the operation suitable for the case will not always be the same. In one case enucleation may be possible; in another the removal of the ovaries and the tubes may be the proper thing; in another, supravaginal hysterectomy; and in another, myotomy.

But I feel sure that a very large number of cases will require no operation, and in this class *restless, officious surgery* is to be condemned. Young women with growing fibroids, if they cannot be removed per vaginam, constitute a most promising class for Mr. Tait's operation, which is a safer procedure than supravaginal hysterectomy or myotomy. The utmost care with reference to any of these operations is absolutely necessary. A clean operator and clean assistants, a clean patient and clean nurses, a clean room and clean tools and sponges, are of the utmost importance. The earlier the removal of the ovaries and tubes is accomplished the better. Once the tumor has attained considerable size, the difficulty of the operation is increased. Early in the disease the incision may be very short, but later an extensive incision may be required. Early in the disease the ovaries and tubes are generally easily reached; later they are under and behind the tumor, or one may be in view and the other behind or beneath the tumor. In such cases I have been obliged to close the abdomen without removing either

Both ovaries and tubes or neither should be removed. If the tumor is causing bleeding or growing or affecting the patient's health, and cannot be enucleated per vaginam, the sooner the ovaries and tubes are removed the better.

Tait's operation is recommended by Thomas for large tumors. Done in such cases, the result will always be uncertain, to say nothing of the difficulty of the operation. Large fibroids frequently contain cavities which eventually become growing cysts, and have already contracted adhesions through which they are largely fed with blood. Unless the last clause of this proposition be true, we must ignore every influence in the growth of fibroid tumors except so called ovarian influence. Twice I saw Dr. Bantock do supravaginal hysterectomy in cases where Tait's operation had failed to arrest the growth of the tumor. Such, however, is the ordinary effect of the menopause on these tumors when non-cystic that in cases of women approaching fifty years it is wise to abstain from any operation; but for young women with large growing tumors the reverse is the case. In cases requiring operation, in which it is not possible or desirable to trust to the removal of the ovaries and tubes, hysterectomy by the extra- or intra-peritoneal method should be accomplished. With reference to statistics, the extra-peritoneal method as practised by Keith is the most favorable—viz. 3 deaths in 38 cases. Schroeder's mortality has been 22.5 per cent.; Hegar's, 12.5; and Kaltenbach's, 14.3 by the same method. Dr. Hofmeier, Schroeder's former assistant, states that myomotomy, when the uterine canal is not opened, is as favorable as ovariotomy, 5 per cent. covering the mortality, which rises to 15 per cent. when the cavity of the uterus is opened. In the formidable cases of extensive enucleation of the tumors from the pelvic cellular tissue, coupled with amputation of the uterus, the mortality was 57 per cent. When in doubt as to the propriety of operating in many cases by hysterectomy, it is well to recall Keith's language: "Were I anxious for operations I might ere now have done two or three hundred during the last ten years; and from what I know and hear a great number of uterine fibroids are removed, or attempted to be removed, without the slightest necessity." He cites the following as suitable cases for operation:

1. Rapidly-growing tumors in young women;
2. Fibro-cystic and suppurating tumors;
3. Soft, œdematous fibroid tumors;
4. Many cases of large bleeding fibroids of any age;
5. Fibroids surrounded by free fluid, the result of peritonitis, provided the fluid reaccumulates after tapping two or three times.

Dr. Mann, in a valuable paper on the "Removal of Solid Uterine and Ovarian Tumors," advocates the removal of fibro-myomata when they act as neuromata: such cases are doubtless rare, and I can add

my own testimony to his in reference to their importance and indorse his statement: "To leave such patients to a slow, lingering, agonizing death seems to me scarcely justifiable when so good a chance for relief and life seems to be afforded."[1]

Pregnancy and labor are occasionally complicated by the existence of a fibro-myomata. The preservation of the life of the mother may depend upon the removal of the growth, the induction of premature labor, or Cæsarean section. The subject more properly belongs to obstetrics, but a signboard at least may be properly erected here for the student. Dr. James R. Chadwick has published in a paper read before the Massachusetts Medical Society at its annual meeting in June, 1885, a report and summary of 10 cases of pregnancy and labor complicated by existing fibro-myomata. Of these cases, 1 miscarried, 2 died, and 7 recovered; in all of the 7 cases of recovery the tumors were subperitoneal. In the remaining 3 cases the tumors were submucous; two of these died, and the third barely escaped death. The question of surgical operation for the removal of these tumors during pregnancy is not a very difficult one to solve. When the tumor is subperitoneal and pedunculated, pregnancy is not a barrier to its removal. Interstitial and submucous fibroids located above the internal os cannot be attacked without destroying the fœtus, and in such cases the laws of the obstetrician should prevail. When the tumors are developed in the cervix uteri, they should be dealt with according to preceding rules, regardless of the existing pregnancy, provided they are sufficiently large to obstruct labor.

Fibro-cystic myomata are probably more frequent than is generally supposed. Counting the abdominal section for all sorts of tumors which I have witnessed done by other operators, and 65 cases in which I have operated myself, making a total of 196 cases, 8 were fibro-cystic myomata.

Péan and Urdy trace the history of gastrotomy for the removal of uterine tumors through three distinct periods. The first, which comes down to 1843, comprises those cases in which surgeons, having opened the abdomen with a view to ovariotomy and finding the tumors to be uterine, shrunk before the consequences of amputation of the uterus and closed the wound. In the second period, that of trials and groping, which comes down to 1863, during which ovariotomy made great advancement, several surgeons, Atlee, Heath, Charles Clay, and Parkinson, finding uterine tumors where they had expected ovarian, did not hesitate to remove them. In the third period, beginning with April, 1863, Koeberlé, in the presence of a doubtful case, prepared for either ovariotomy or hysterotomy. Storer, Péan, and others deliberately resorted to gastrotomy for the purpose of removing the uterus affected

[1] *Amer. Journ. of Obstet. and Diseases of Women*, vol. xx., May, 1887.

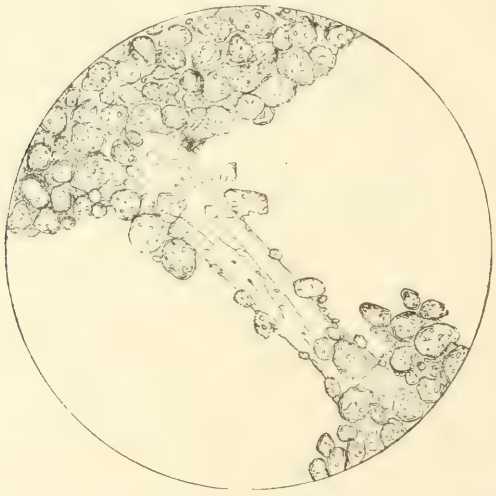
by tumors (Barnes). Forty years have elapsed since 1843, the end of the first period, and we are now only planted firmly on solid surgical ground with reference to these tumors, be they solid or cystic, when they can only be removed by gastrotomy. The credit of this great triumph in surgery belongs very largely to Kimball, Koeberlé, Péan, Keith, Bantock, Schroeder, and Billroth.[1]

Adenoid Growths.

Johnstone has proved that the endometrium is a glandular structure —that it belongs to the adenoid tissues.

Englemann and Kundrat long ago, after diligent investigation, arrived at the conclusion that it is not mucous membrane. Figs. 182, 183,

Fig. 182.



Fibre of the Endometrium and Different Grades of Corpuscular Development (× 3000; after Johnstone: *Brit. Gyn. Trans.*, vol. vii. No. 7).

184 show the glandular corpuscular tissue entirely exhausted; there is nothing left of the former endometrium except its honeycomb-like fibrous stroma. All neoplasms growing from and depending on such an endometrium for the elements of their construction are pathologically and anatomically "adenoid growths." The lining membrane of the canal of the cervix is a mucous membrane. Underlying this is a layer of loose cellular tissue. Again, beneath that and imbedded in the tissue of the cervix are the glands of Naboth. Neoplasms of the cervix uteri involving in their construction these glands are also "adenoid growths." Neoplasms of a true mucoid type involving in their construction only the elements of mucous membrane are found growing

[1] For the methods of using galvanism in fibroid tumors, see Vol. I. p. 399.

from the lining membrane of the cervical canal, and, becoming polypoid, constitute the true uterine "mucous polypus."

FIG. 183.

Endometrium of a Woman aged Sixty Years. The utricular follicles are all, save one, denuded of epithelium; that one retains its epithelial lining (× 800; after Johnstone).

PATHOLOGY.—Chronic inflammation of the lining membrane of the cervical canal and body of the uterus, resulting in hypertrophy of their

FIG. 184.

Endometriun of a Woman aged Twenty Years (× 800; after Johnstone).

histological elements, giving rise to an increased discharge of their normal fluids, and rendering them abnormal in quality, producing a typical

chronic uterine catarrh, is the prime factor in the pathological process resulting in the formation of adenoid growths. The endometrium may be but slightly affected, a simple catarrhal swelling existing, with but little involvement of the utricular follicles. But there may exist a uniform thickening of the endometrium, with involvement of the utricular follicles, or the disease may exist, lacking uniformity of intensity, obtaining in patches. These isolated spaces of diseased endometrium rise above the surface, constituting the sessile variety of adenoid growths. Later, these growths, developing in the

FIG. 185.

Diffuse Papillary Adenoma of Body of Uterus, with Polypi (after Winckel).

direction of the least resistance, may become polypoid in form. But it should be remembered that a difference between a diffuse hypertrophy of the endometrium and a polypoid excrescence of it does not exist. These polypi and the sessile growths have the same histological formation. An ordinary uterine catarrh, chronic in kind, has

been described by Olshausen as "endometritis fungosa." The same disease, of a more aggravated type, affecting more profoundly the utricular glands, has been designated by Schroeder "adenoma uteri diffusum."

Very small pediculated polypi, varying in size from a buckshot to a grape, coexisting with unusually small sessile adenoid growths, are frequently met with in women who are the subjects of uterine catarrh, so often associated with lacerations of the cervix. More rarely we find larger and more complex adenoid growths, pediculated or resting directly upon the endometrium, ranging in size from a chestnut to a hen's egg. Specimens of the smaller variety are usually multiple, often set in clusters, while those of the large kind are ordinarily single. The small ones are probably utricular follicles, closed at the mouth, over-distended, and projecting above the endometrium. The larger variety involves patches of the endometrium, and consequently all of its constituents. The smaller ones are composed of a thin cyst filled with a light fluid, and are easily ruptured by pressure.

When a simple adenomatous polyp has for its foundation a gland of Naboth, the process of development is an enlargement and gradual projection of the cyst above the mucous membrane of the cervix or portio vaginalis. It is observed as a rounded elevation with a broad base, which later gives place to a well-defined pedicle upon which hangs the polyp.

FIG. 186.

Glandular Polyp (De Sinéty).

The large variety of adenoid growths may be termed compound, to distinguish them from the simple kind. For their development they depend on patches of the endometrium of clusters of the glands of Naboth. In these growths there is a large quantity of hypertrophied glandular tissue drawn out, and a decided proliferation of tissue, filled with uterine follicles, more or less distended with a fluid of varying consistency. The capsule is thick, and the divisions running through the growths show hypertrophy of the fibrous stroma, originally the framework of the endometrium. This variety may be single or diffuse; usually, however, but one large growth exists, and it is frequently as large as a hen's egg. It is often lobulated, tough, elastic, and irregular in shape. Frequently these growths are attached to the endometrium by a well-defined pedicle; often they stand directly upon it. When a large growth is developed from the glands of Naboth, it involves the constituents of the mucous membrane and underlying cellular tissue, and occasionally the true tissue of the portio vaginalis.

Such growths contain cavities, dilated Nabothian glands lined with cylindrical epithelium, and constitute the so-called "channel polypus" of

Fig. 187.

Channelled Polyp (De Sinéty).

Oldham. When the growth is made up of Nabothian ovules in different stages of distension, connected by cellular tissue and covered with a thinned mucous membrane, it may present a very irregular shape.

Because of the presence of cystic elements these growths are soft. When adenoid growths are developed within the uterus they are covered with cylindrical epithelium. When developed from the cervix they often present both the cylindrical epithelium from the canal and the pavement epithelium of the portio vaginalis. The blood-vessels on their surfaces are thin-walled and readily bleed. When the growth is intra-uterine and pediculated, it is frequently forced into the dilated cervix, where it is easily seen. When they develop in the cervix, they either dilate and occupy it or hang by a pedicle from one of the lips. "Polypi have already been examined in which there was obvious multiplication of the glands and hyperplasia of the glandular tissue, either with or without dilatation of the glands. These polypoid neoplasms are best classified as adenomata. To this category belong almost all those forms which proceed from the lips of the os uteri, and which have involved the most extreme portions of the cervical mucous membrane."[1]

Mucous polypi of the cervical canal are usually small growths. They are spherical in form, soft in consistence, occasionally flattened, varying in size from a pea to an almond. Generally they contain a sticky fluid; occasionally they are firm in consistency, and such should be

[1] Gusserow: *Billroth's Handbuch*, vol. i.

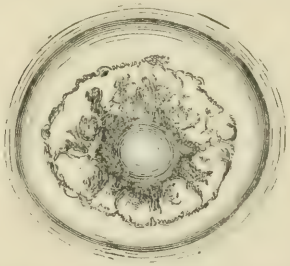
regarded as papillomata. They may be found pouting from the os uteri, as seen in Fig. 189, or they may be observed occupying the cervical canal.

Thomas[1] describes a cellular polypus depending upon a hypergenesis of the cellular tissue beneath the cervical mucous membrane. These growths are pediculated and may attain large size. Barnes[2] describes a "hypertrophic" polypus of the cervix uteri. I regard these growths as identical. Dr. Emmet[3] speaks of a hollow polypus presented by Dr. Henshell of New York. Similar cases are reported by Colombat,[4] who refers to cases by Richerand and Jules Cloquet. Mad. Boivin pictures such a one in her work. This variety of polypus seems to be

FIG. 188.

Glandular Polypus (Thomas).

FIG. 189.



Mucous or Glandular Cervical Polypus.

a cast of the uterine cavity which has been loosened above and expelled into the vagina; still adhering at the cervix, its cavity becomes filled with blood, giving to the mass the polypoid shape. Some authors describe a form of uterine polyp under the caption "placental polyp." These growths are due to the development of bits of retained placenta, and do not originate as neoplasms. They cause all the symptoms of intravaginal growths, and are often discharged with a great loss of blood. When encountered they should be removed with a strong curette or forceps.

SYMPTOMS AND COURSE.—The symptoms accompanying all these uterine neoplasms are similar. Bloody and muco-purulent discharges are found constantly. In some instances a "watery flow" is complained of before the onset of menstruation. The bloody discharge may

[1] Thomas: *Diseases of Women.*
[2] Barnes: *Diseases of Women.*
[3] Emmet: *Gynecology.*
[4] Thomas: *Diseases of Women.*

be increased in quantity—menorrhagia—or intra-menstrual bleedings —metrorrhagia—may occur. If the quantity of blood lost be large or the bleedings frequent, the patient becomes anæmic. Such a condition is aggravated by exercise or coition, or any cause, such as constipation, conducive to pelvic congestion. The amount of the muco-purulent discharge will depend on the severity of the uterine catarrh which probably gave origin to the neoplasm. Pain is present in proportion to the amount of uterine tenesmus existing. This, in turn, will largely depend on the size of the growth. When the growth has been expelled from the uterus, pain ceases. If the growth be large, vaginal discomfort will be experienced and sexual relations obstructed. Should the pedicle of the growth be very long, the growth will slip through the ostium vagina; and should the pedicle be slender enough, it may be lost spontaneously.

Diagnosis.—A woman presents herself with complaints of menorrhagia, metrorrhagia, and leucorrhœa, with severe bearing-down pains at her periods, and a constant backache. She brings with her a typical picture of an intra-uterine growth. Bimanual examination will determine an increase in the size of the uterus. The cervix is probably closed. Dilatation of the cervix with a hydrostatic or metallic dilator should be made, and a finger passed into the uterine cavity will discover the enemy in position. The patient's symptoms may be less typical: she may give none; but upon examination with the finger a polypus may be found lying in the vagina, or with the speculum may be seen pouting from the os externum, or an erosion of the os may be present, and may be suggestive of a small mucous polyp lying in the cervical canal out of sight. Dilatation of the cervix in all doubtful cases ought to be resorted to, and careful exploration should be made with the finger when the uterus is enlarged, and with Thomas' dull curette whether the organ is enlarged or not. The diagnosis, occasionally difficult, will be reached by careful consideration of the symptoms present and by an exact examination of the genital tract, aided by the speculum and dilator. Sometimes the differentiation of these cases of cancer may present some difficulties. The removal of a small portion and an examination by a competent microscopist will settle the question.

Treatment.—Adenoid fungosities of the endometrium may be easily diagnosed by means of Thomas' dull wire curette, but for their complete removal I prefer the curette of Récamier. The patient should be etherized and placed in the lithotomy position. It is rarely necessary to dilate the cervix, as one or other spoon-shaped end of the instrument will, with safe pressure, pass into the uterine cavity. The curette should be firmly applied to the entire endometrium; the uterine cornua ought not to be neglected. After clearing off all fungosities the endo-

metrium should be treated for some time with local applications of tincture of iodine. Large adenoid growths of the endometrium, pedunculated or otherwise, after free dilatation of the cervix, unless the growth has already appeared at the partially-dilated cervix, should be seized with strong forceps and detached from its base by torsion, curette, or spoon saw.

In attempting to remove these growths I have always experienced difficulty in getting the wire of the écraseur beyond the growth. The wire has occasionally parted, and when the growth had been removed by torsion the track of the wire was seen on the tumor. The ordinary volsellum forceps is not well adapted to the removal of polypi, and I have found a better instrument in one designed by the late Dr. Bradley of Burgettstown, Pa., and made by an ordinary country blacksmith. Previous to his death the doctor presented me with his instrument; I use it, and it answers the purpose perfectly.

Pedunculated polypi of firm consistency presenting at the internal os or ostium vagina are treated by division of the pedicle. This may be accomplished with the écraseur, galvano-caustic wire, or scissors with plain or serrated edges. Ligation of the pedicle is not necessary. Should some bleeding occur, a hot-water douche, an application of iodine, or a temporary tampon soaked with alum-water will arrest it. Small mucous polypi in the cervix should be snipped off with the scissors or be ruptured with the forceps or curette, and the base immediately painted with tincture of iodine. In making division of a pedicle it is preferable to divide as far from the growth as possible.

Ligation of the pedicle is apt to become a source of septic poisoning, and for this reason should be omitted. It will occasionally happen that a firm cellular polypus presents at the ostium vaginæ with such wonderful similarity of appearance to the uterus that it is difficult to decide whether it is one of these growths or an inverted uterus. I have seen the growth implanted in the dilated cervix, the latter beyond my reach, and deception so complete that nothing but an incision into the presenting dome of the tumor revealed the real nature of the object. The case I refer to was sent to me for relief of inversion of the uterus. I removed the growth by torsion, wrenching it from its bed in the funnel-shaped cervical cavity. A week later the patient left the hospital and was in good condition.

Those adenoid growths arising from the glands of Naboth at their earlier stages of development may be arrested by opening the sacs and scraping out their contents, and afterward applying iodine freely to what remains. When they become pedunculated they are to be treated as other growths of that class.

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THE MALIGNANT DISEASES OF THE UTERUS.

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The malignant diseases of the uterus comprise the various forms of carcinoma, tumors characterized by the presence of epithelial formations, and sarcomatous growths composed mainly of the round and spindle-shaped cells of connective tissue. Although differing in many respects as regards their clinical features, they possess in common a tendency to infect neighboring tissues, to recur after removal, and ultimately to destroy the life of the patient.

Carcinoma Uteri.

Frequency.—No physician needs to be reminded of the frequency of uterine cancer. In the statistics gathered by Sir James Y. Simpson from the report of the Registrar-General's Office, of 87,348 deaths from cancer in England between the years 1847 and 1861, inclusive, 61,175 occurred in women and 25,633 in the male sex. Up to the fifteenth year the difference in the death-rate in the two sexes was immaterial. With the advent of puberty a marked change in the relative proportion became manifest. Thus, between the fifteenth and twenty-fifth years the ratio of males to females was 100 : 123; between the twenty-fifth and thirty-fifth years, 100 : 255; between the thirty-fifth and forty-fifth years, 100 : 367; and between the forty-fifth and fifty-fifth years, 100 : 335. The difference then became less pronounced, though through all the decades following the deaths were nearly twice as frequent in the female as in the male. The extent to which the preponderance in women is due to uterine cancer has been demonstrated by Schroeder, who, from statistics collected from various sources, found that of 19,666 cases of cancer in the female sex, 6548 were of uterine origin. Wagner, in tables based upon the post-mortem records of Vienna, Prague, and Leipsic, showed that in 5112 autopsies there occurred 441 cases of cancer, and of these 113 were of uterine origin. Emmet states that of 2153 women admitted to the Woman's Hospital,

60, or 2.78 per cent., had malignant disease of the uterus, and of 2447 women in his private practice suffering from sexual disorders, 53, or 2.19 per cent., had uterine cancer. Glätter estimated that 2.5 per cent. of all the women in Vienna over twenty years of age die of uterine cancer. Hofmeier[1] states that in the Berlin Polyclinic, of 16,800 patients, 603, or 3.6 per cent., suffered from uterine cancer, and that in Schroeder's private practice, of 9400 patients, 299, or 2.18 per cent., were victims of the disease, the latter percentage corresponding almost exactly to that reported by Emmet.

PATHOLOGY.—The old familiar division of uterine cancer into scirrhus, medullary cancer, colloid cancer, and epithelioma has at the present time ceased to be tenable. It was based upon tactile impressions, physical appearances, and peculiarities of growth. It represented not distinct varieties, but accidental conditions or successive stages of development. It served to introduce into the subject an element of confusion detrimental to progress, as rarely two observers were found in agreement as to the classification of the disease in the same patient.

A true pathology is necessarily based upon minute structure, modes of development, and variations due to site. The following description is gathered from the works of Ruge and Veit, whose investigations correspond closely with clinical experience, and to whom we owe the principal distinctions upon which modern treatment is based.

All writers have distinguished cancer of the body of the uterus from that of the cervix. Ruge and Veit have rendered an important service by demonstrating, in addition, the essential independence of cancer of the vaginal portion and cancer of the cervix proper (cervical mucous membrane and adjacent structures).

A. *Cancer of the Body of the Uterus* (Ruge and Veit).—Cancer of the body of the uterus always develops from the endometrium. The malignant growth may be of a villous character, or may occur in the form of wart-like protuberances varying in size from a pea to that of a bean. It may be diffused or circumscribed.

The diffused form in most instances involves the entire surface of the mucous membrane to the os internum, the cervix long remaining unaffected. In rarer instances the greater part of one wall remains free, or a nodular growth upon one side corresponds to a depression in the opposite wall, while at a higher point the reverse relation may exist. Commonly, the associated irritation leads to uterine hypertrophy, as in early pregnancy. A thinning of the muscular walls occurs only in cases of rapid growth. The cavity may become narrowed; sometimes it becomes of an S-shape, or where extensive destructive changes

[1] "Zur Statistik der Gebärmutter Ruhes," *Zeitschrift für Geburtshülfe und Gynäkologie*, vol. x. p. 270.

have taken place it may be converted into a vast cloaca, the walls of which remain rigid or have an apparent eccentric growth, in which at

FIG. 190.

Cancer of the Body of the Uterus, diffuse form (Ruge and Veit).

times the disintegrated tissues may be retained by the narrowing of the os internum.

In the circumscribed and polypoid form the growth is attached by a pedicle to the uterine walls, and depends into the uterine cavity. Its further extrusion is not superficial, but radiates toward the peritoneum. If these polypoid bodies disintegrate or are thrown off to a great extent, nodular bodies may persist in the uterine walls; but the occurrence of primary nodules in the muscular structures, unconnected with disease of the endometrium, is extremely questionable.

Under the microscope primary cancer of the body presents two forms, both of which have their origin in changes which take place in the glandular structures of the endometrium.[1]

[1] This section is placed in connection with carcinoma of the body, as the changes in the latter are similar to those which take place in the cervix.

In the one form the glands push out lateral offshoots which unite with one another and assume a trabecular arrangement with little intervening stroma. The ciliated cylindrical epithelia proliferate and become large flat epidermoidal cells. The glands increase sometimes to more than fifty times the normal size. The cell-proliferation may be confined to one wall, gradually encroaching on the central canal, which assumes

Fig. 191.

Section through Cancer of Portio: *p*, pavement epithelium; *k*, cancer; *kn*, cancer-nodules; *dr*, remains of gland.

a curved shape, while upon the opposite wall there persists a single layer of cylindrical cells; or the process may develop in different portions of the gland, between which the gland structures may preserve for a time a nearly normal appearance.

In the second form the glandular type is in general preserved. The central canals of the normal glands enlarge, and offshoots are pushed from the walls inward, or outward into the circumjacent connective tissue. From these primary offshoots new outgrowths form, and this process continues until the original gland is converted into a tangled mass of coiled bodies in which the canal proper is restricted to narrow dimensions. But in the rule only one layer of cylindrical cells attach to the processes, and it is exceptional for the cells to undergo polymorphous changes.

In both varieties the retro-peritoneal and lumbar glands are early affected; the barriers of the internal os may be passed, and the cervical canal be secondarily invaded; the disease may extend to the bladder or rectum—an event occurring usually, though not without exception, after preliminary peritoneal adhesions; the invasion of the parametria is commonly of late occurrence, and, as a consequence, death from uræmia occurs more rarely than in cervical cancer; and metastatic nodules may develop in almost all the organs, the vagina furnishing a frequent seat of these formations.

B. *Cancer of the Vaginal Portion.*—Ruge and Veit[1] define as the vaginal portion the part extending from the os externum to and somewhat beyond the vaginal attachment. The forms of carcinomatous disease seated within these limits are manifold, without, however, the degree of development being determined by the external appearances alone, nor do typical microscopical appearances always correspond to characteristic clinical phenomena.

Fig. 192.

Adenoma Malignum (Ruge and Veit).

In the rule, the smallest changes and the slightest tendency to extension are induced by the nodular variety. Thus, a circumscribed shallow ulcer with cancerous borders may result from the discharge of a superficial nodule, or the disease may penetrate deep into the tissues and give rise, as the new formations separate, to deep funnel-shaped excavations characterized by the very moderate extent of the invasion of the adjacent tissues. Allied to these are cases of apparent enormous losses of substance, in which the carcinoma spreads to the vagina, and the vaginal portion disappears as the result of absorption and fatty degeneration, and a large cancerous funnel is left, the apex of which extends to the cervical canal.

Cauliflower growths begin as small papillary elevations, respecting the os and extending toward the vagina. The surface has either the appearance of granulation tissue, easily distinguishable from the moist shiny surface of true erosions, or, as is more common, presents the whitish-yellow aspect of pronounced cancer. In the course of further development the superficial indifferent tissue is thrown off, and the growth into the vagina is either fungiform, with a relatively smooth and slightly arched surface, in which case the changes in the portio are seldom deep, or it occurs as a large tumor covered with villous outgrowths which fill the entire vaginal space.

Thus in the several forms of carcinoma of the vaginal portion the disease usually tends to invade the vagina, though sometimes it finally attacks the parenchyma of the cervix. In such a case the ulceration resulting from the breaking down of the tissues assumes a crater-like form, with the apex directed toward the cervix. In its progress the disease tends to overleap anatomical boundaries, and may attack the bladder, the body of the uterus, the intestines, and the peritoneum. But the body of the uterus is never attacked in the early stages. Second-

[1] "Der Krebs der Gebärmutter," *Zeitschrift der Gynäk. und Geburtskunde*, Bd. vii. p. 138.

ary corporeal carcinoma only occurs after the upper part of the cervical parenchyma has been invaded.

Carcinoma of the vaginal portion in its several forms respects the limits of the os externum, spreads toward the vagina, and has no tendency to invade the cervical mucous membrane. Metastases are first seen in the vagina, and then present the characteristics of the soil in which the disease was originally developed. Thus metastases are glandular if the disease of the vaginal portion was of the glandular type.

FIG. 193.

Carcinoma of Vaginal Portion of Uterus, disease invading parenchyma of cervix (Ruge and Veit).

As a slight exception to the general rule as to the essential independence of cancer of the portio and of the cervix, Ruge and Veit admit in certain cases changes in the cervical glands bordering upon the os externum—changes which, however, are recognizable only by means of the microscope. In cases of ectropium the growth seated upon the everted mucous membrane may be mistaken for one upon the vaginal portion. Finally, cancer of the cervix and portio may in rare instances coexist: whether occurring as independent processes or whether the one is secondary to the other is a matter which has not as yet been determined.

The greater number of carcinomatous affections of the vaginal portion are derived from newly-formed glandular structures (erosion-glands), which undergo in their subsequent course the same changes that have been described in connection with carcinoma of the body.

In rare instances the simple glandular form is preserved (adenomatous form), the gland-tubules, lined with a single layer of delicate cylindrical epithelium, penetrating deep into the tissues. Often the tubules lie close together, so that the intervening stroma is completely destroyed.

In addition to these glandular forms, Ruge and Veit recognize a third variety—viz. carcinomatous cauliflower growths derived from connective tissue, in which the proliferative process begins beneath the pavement epithelium. The latter may either remain for a long time intact, or a thinning may ensue, with widening of the papillary spaces and gradual disappearance of the intervening epithelial pegs. Cancer is formed from these fungous elevations in consequence of degenerative

changes in the deep-lying, small round stroma-cells. These changes consist in the increase of the cell-protoplasm and the enlargement and multiplication of the nuclei. The cells become aggregated, forming cancer-nests, contained in large alveoli separated by narrow partitions of connective tissue.

C. *Cancer of the Cervix (Cervical Canal and Adjacent Structures).*—Cervical cancer may be derived either from a connective-tissue proliferation or it may be of glandular origin.

The connective-tissue form occurs first as a nodular body situated beneath the intact mucous membrane, with a special tendency to spread outward toward the vaginal portion. It may likewise extend upward toward the cervix or deep downward until the epithelium of the vaginal portion is nearly reached. The cervical orifices are, however, respected. In the end the growth may break through the mucous membrane, undergo destructive changes, and lead to the formation of a cavity, the walls of which may be derived from cervical, or in advanced cases from paracervical or parametritic, tissues. At an early period the disease may extend upward and invade the uterine muscular tissue and undermine the uterine mucous membrane. In these cases the vaginal portion often long persists, the finger passing above the external os into a great ichorous excavation.

FIG. 194.

Carcinoma of Cervix, with formation of cavity (Ruge and Veit).

The glandular variety resembles the uterine form. The surface is uneven, with warty elevations. As the disease rapidly penetrates the stroma, it is rarely recognized in the early stages.

In women with a narrow os externum the canal may be dilated by the neoplasm, as in cervical abortions. Where laceration and ectropium coexist it is not easy to distinguish a cervical cancer from one of the portio.

In cancer derived from cervical glands the latter may proliferate to an enormous extent, and traverse the cervix to the borders of the portio vaginalis, to the uterus, and outward to the peritoneum. The epithelium of the glands retains its cylindrical form. The extension results

from a branching process by means of which the stroma is destroyed. This form is comparable to the malignant adenoma of the body. More frequently the multiplied glands retain their lumina, and the proliferating epithelia finally form large cancer-nests.

In a third variety the cylindrical epithelium of the cervical mucous membrane occurs in many layers, forming an epidermoidal stratum, from which epithelial offshoots push into the underlying tissues and destroy the stroma. In this way thick massive epithelial trabeculæ are formed, in which epithelial "pearls" are found as in cutaneous forms of cancer.[1]

The Invasion of Neighboring Organs.—The further progress of the disease is the necessary consequence of the intimate connection of the uterus with the contiguous organs. We have already seen how it may extend from the cervical mucous membrane to the muscular structure of the cervix, and upward to the body of the uterus, and how the mucous membrane of the vagina becomes covered with secondary granulations. Generally, in post-mortem examinations the limits between cervix and vagina can only be determined by their relations to the bladder and rectum. The cellular tissue around the uterus and between the folds of the broad ligaments becomes invaded by gland-like tubules or isolated granulations. Thence the disease spreads to the bladder and rectum, attacking successively the intermuscular and submucous connective tissue, and finally the mucous membrane. From the bladder it creeps upward to the apertures of the ureters. Sometimes both anterior and posterior culs-de-sac of the uterus become filled with cancerous deposits. The pelvic glands are always tumefied, and are frequently transformed into a mass like the diseased tissue of the primitive tumor. Single glands may attain the size of an apple, and a

[1] Hofmeier in a statistical report classified the cases, so far as was practicable, in accordance with the primary seat of the disease. Of 812 cases, the portio was first affected in 236, the cervix in 181, and the body in 28 instances. The seat was undecided in 367 instances.

The average age in carcinoma of the portio was forty-two years: of the entire number (236), 7 had never borne children and 33 were primiparæ. The average age in carcinoma of the cervix was forty-seven years: of the entire number (181), 14 had never borne children and 23 were primiparæ. In carcinoma of the portio 17 were under thirty years of age, 84 under forty years, 34 under fifty years, and 1 under sixty years. In carcinoma of the cervix there were 3 under thirty years, 34 under forty years, 66 under fifty years, and 20 under sixty years. Thus, carcinoma of the cervix is shown to occur with greatest frequency in the later years of life and often many years after the climacteric.

In carcinoma of the body the average age was 54.5 years. 2 occurred between thirty and forty years, 3 between forty and fifty years, 15 between fifty and sixty years, and 6 between sixty and seventy years. Of the 28 cases of cancer of the body, 6, or 21 per cent., were nulliparæ, while of 417 cases of cancer of the portio and cervix combined, 11, or 2.5 per cent. only, had never borne children ("Zur Statistik der Gebärmutter Krebs," *Zeitschr. f. Gebürtsk. u. Gynäk.*, vol. x. p. 276).

plexus may become the size of a man's fist. Sometimes the ovaries are involved, though it is difficult in microscopic examination to determine whether a degenerated tumor glued to the postero-lateral surface of the uterus is an ovary or a lymphatic gland. Wagner[1] found the ovaries reported as affected in 22 cases out of 171, in most of which the degeneration was propagated from the fundus uteri. From an early period of the malady there is marked pelvic peritonitis, with formation and organization of false membranes. In this way adhesions form between the Fallopian tubes and the adjacent organs, and the whole pelvic contents become at last reduced to a nearly solid, immovable mass.

Etiology.—The etiology of uterine cancer is obscure. The most important of the conditions which favor its occurrence are age, inheritance, childbearing, and erosions.

Gusserow[2] collected 2265 cases from various sources. Of these, two occurred prior to the twentieth year. Of the others,

81	cases	occurred	between the	20th and 30th years.
476	"	"	"	30th and 40th "
771	"	"	"	40th and 50th "
600	"	"	"	50th and 60th "
258	"	"	"	60th and 70th "
82	"	"	after 70 years.	

Thus the largest number occurred at the climacteric period. In more than three-fourths of the cases the disease appeared after the fortieth year. It is not entirely clear whether age creates conditions which predispose to the development of uterine cancer, or whether the statistical frequency of uterine cancer during middle and advanced life is the result of the diminished resistance afforded by the tissues.[3]

In addition to the two cases which occurred in women under twenty years, Eckardt[4] has recently reported a third instance in a young girl nineteen years of age.

The influence of heredity in creating a predisposition to cancerous affections of the womb is still a subject concerning which marked differences of opinion exist. Paget, indeed, believed that in as many as one case in three the disease was traceable to an ancestral taint. Gusserow collected from different authors 1028 cases of uterine cancer, in 79 of which, or in 7.6 per cent., some family relative was reported to have died of a cancerous affection. Barker reported 487 cases from his private practice, in 36, or 7.3 per cent., of which a member of the family presumably had had cancer. But in Gusserow's collection 9 were contributed by himself, and of these he expresses some doubt as to the correctness of the histories given. The evidence of patients, as

[1] *Der Gebärmutter Krebs*, p. 68.

[2] *Billroth's Handbuch der Frauenkrankheiten*, 4th part, p. 186.

[3] Vide note, p. 608.

[4] Eckardt: *Arch. f. Gynäk.*, vol. xxx. p. 471.

a rule, consists of little more than the statement that they had been told that an ancestor had died of the disease. The value of such testimony may perhaps be estimated by the fact that in a New England village of 1500 inhabitants, where I have spent many summers, a quack-doctor supported himself and family for years by the treatment of pretended cancer which occurred in that small community. Beigel found only 2 cases of possible transmission in 88 patients with uterine cancer.

There is no doubt that the frequency of cases referable to inheritance diminishes with more exact diagnosis and more critical methods of investigation. Still, many remarkable coincidences of undoubted authenticity exist. Of these, one of the most striking has been reported by Broca,[1] where a mother died of cancer of the breast. Of her four daughters, two died of cancer of the liver and two of cancer of the breast. Of the third generation ten members died of cancer. Hardly less extraordinary is the history of a family in the clientèle of Dr. Barker, where eight members died of cancer, though there was no history of the disease in any of the immediate ancestors.

The influence of childbearing in creating a predisposition to cancerous affections of the uterus is apparently very considerable. In 580 cases collected by Gusserow[2] the total number of children at term was 3025, or an average of 5.1 to each female—an average somewhat in excess of ordinary fertility. Hofmeier[3] reports, from material gathered from the Berlin Polyclinic and Schroeder's private practice from April 1, 1876, to Jan. 1, 1884, that of 849 women who had borne children, 106 had had one child, 667 had an average of 5.8 pregnancies, and 76 had over 10 pregnancies.

In a considerable proportion of cases the disease develops soon after childbirth. West found this to occur in 11.3 per cent. of his cases, and Gusserow states that in 48 cases observed by him, 9 occurred within a year of confinement. Hofmeier calls attention to the exceptional malignity of carcinoma developing subsequent to childbed, which he attributes to the development of the lymphatics and the succulence of the connective tissue.

In Hofmeier's statistics of 812 women, 39 had never borne children. Emmet,[4] however, goes so far as to assert that he had never known a woman to have any form of epithelial cancer of the uterus unless she had at some time been impregnated. I can recall a case of cauliflower excrescence in an elderly unmarried woman who presented all the anatomical evidences of intact virginity. In certain similar cases, however, W. A. Freund has shown that the uterine disease was secondary to cancer of the rectum or bladder.

[1] *Traité des Tumeurs*, vol. i. p. 151 (*vide* Beigel, p. 511). [2] *Loc. cit.*, p. 191.
[3] "Zur Statistik der Gebärmutter Krebs," *Zeitschr. f. Geb. und Gynäk.*, vol. x. p. 272.
[4] *Principles and Practice of Gynecology*, p. 496.

The descriptions of Ruge and Veit give special prominence to the importance of erosions as a source of local irritation, and frequently as the starting-point of malignant uterine growths. Indeed, it is not always easy to determine in the papillary form, without microscopic examination, whether the lesion is benign or whether there exists already the primary stage of a cancerous affection. Emmet lays great stress upon the importance as an etiological factor of cervical lacerations—an importance doubtless due to the associated catarrhs and to secondary changes in the adjacent mucous membranes.

In carcinoma of the body Ruge and Veit found there was no statistical relation to either endometritis, retro-displacements, or childbearing. A very striking coincidence was found to exist with late cases of menstruation, referable in the opinion of the authors to some source of irritation, which by maintaining a hyperæmic condition produced chronic alterations of the mucous membrane and in predisposed individuals led to malignant disease.

Symptoms.—So long as the carcinomatous affection is limited to the vaginal portion no symptoms occur previous to ulceration. Indeed, in many cases, even after the occurrence of degenerative changes, the health of the patient continues excellent, so that commonly when the disease is first detected extensive destruction of the portio and vagina has already taken place, and the time for effective local treatment is past. Gusserow mentions as a rare exception the invasion of the cellular tissue by cancerous nodules forming elevations in Douglas' cul-de-sac, which cause peritoneal pains in advance of ulceration.

In most instances uterine hemorrhage is the earliest symptom to which the attention of the patient is attracted; but occurring, at the outset, where the woman has not passed the climacteric, in most cases at or near the menstrual period, it is apt to be regarded as simple menorrhagia. After the climacteric the occasional recurrence of uterine hemorrhage, so long as it is not very severe, is too often regarded as a natural incident of the change of life. In these early stages hemorrhage must be mainly attributed to disturbances in the circulation of the affected part.

Sometimes preceding, often accompanying, and invariably following hemorrhage, we find certain leucorrhœal discharges, the cause of which, as well as that of the later hemorrhages, is to be found in the processes of ulceration. These consist at the outset in the exfoliation of the surface epithelium and the layer of indifferent tissue that covers the morbid process. Certain of the cells undergo degenerative changes. Frequently they become spherical and are filled with granulations, or a vesicular condition may be induced by the formation of cavities in their midst, or they may contain several nuclei or even fully-developed cells. Once these forms were regarded as specific, and were therefore termed

cancer-cells; but they are met with under physiological conditions in the bladder and placenta. Finally, the cells in the gland-tubules are set at liberty, and form with the transuded serum a whitish liquid, sometimes termed the cancer-juice. As the more superficial constituents of the gland-like bodies dissolve away, the thin connective partitions remain, and float when water is poured upon them in the form of delicate vascular fringes, or when they are thicker and the vessels of considerable size they may resemble the granulations of a wound. Corresponding to these changes the discharges are inodorous, sero-purulent, and of moderate extent. Menstruation is profuse, or more rarely irregular hemorrhages occur only after coitus, or where constipation exists, or after bodily exertion.

In interstitial forms a softening may result from an increase in the cells, followed by a giving way of the connective-tissue partitions, so that two or three contiguous alveoli communicate together. These finally open and ulceration of the neoplasm begins.

The various forms of ulceration are associated with papillary granulations or fungosities composed of dilated vessels with thinned walls, which rupture with the greatest facility. These terminate sometimes in loops, sometimes in club-shaped extremities. They are subject to a series of alterations, beginning with the multiplication of their nuclei, by means of which their walls are thickened and their central cavity strictured or obliterated; this is followed by arrest of circulation, and ends in fatty molecular disintegration. Similar changes take place in the small vessels and capillaries within the tumor, and from the obliteration of the veins there result abolition of return circulation and augmented pressure from behind, which unquestionably is one cause of rupture of the vessels and hemorrhage. Sometimes in larger arteries the tunica adventitia may degenerate, the circulation continuing, but with more or less obstruction. At length a point is reached when the inner coat can no longer resist the shock of the blood-wave, and the blood escapes, giving rise, if the point of perforation be near the surface, to considerable hemorrhage.

Another result of these circulatory disturbances is sphacelation of the tissues deprived of the blood requisite for their nutrition. If one of the large veins be obliterated a considerable portion of the tumor mortifies. The chemical and molecular decomposition of the tumor is still further increased by liquids from various sources that stagnate in the vaginal cul-de-sac, so that almost all old ulcerated epithelial growths offer more or less extended portions in a state of moist gangrene, to which the peculiar odor of the discharges is due. The destructive action may extend to the body of the uterus, until only a rudiment of the fundus remains; communications may take place between the vagina and rectum on the one hand, and between the vagina and bladder on

the other; and, finally, the lymph-glands, which by this time have become adherent to the surrounding tissues and to one another, may soften and ulcerate, and thus a large portion of the pelvic cavity may become converted into a vast cloaca, furnishing an ichorous, stinking, sanguinolent discharge.

From the occurrence of the first symptoms to the death of the patient the interval does not usually, in cancer of the cervix and vaginal portion, exceed one year and a half.

It is a curious fact, considering the abundant losses of blood associated with uterine cancer, that death from hemorrhage is almost never observed.

In carcinoma of the body the most striking symptom is hemorrhage. It occurs at the end of menstrual life or years after the climacteric. It increases in intensity with the progress of the disease. Often mucous discharges precede the hemorrhage or fill up the intervals between them.

A stinking odor is not distinctive. It signifies tissue undergoing putrefaction within a cavity possessed of rigid, inelastic walls. No odor is of necessity observable before the destructive changes have begun and so long as the muscular structures are of normal thickness.

The pains are mostly of a paroxysmal nature. They are relieved by the expulsion of portions of the growth, and may even be made to disappear by vigorous scraping with the curette. The cachexia is often late in making its appearance, and the course of the disease is relatively slow. Bladder troubles, uræmia, and rectal compression are not indeed rare, but ordinarily the primary symptoms first bring the patient to the physician.

The duration of the disease from the time of the first observed symptoms without palliative treatment is at least two years.

Sharp lancinating pains are usually considered as pathognomonic of uterine cancer, yet this symptom belongs generally to an advanced stage of the disease. So far as it alone is concerned, the morbid process may assume formidable proportions before it awakens the attention of either patient or physician. Pain is rare while the disease is limited to the cervix, and only then when inflammatory irritation is present in the neighborhood of the morbid growth. The peculiar dolorous sensations associated with uterine cancer develop chiefly when the pelvic cellular tissue is invaded. It is the cellulitis that causes the suffering experienced in urination and defecation. When rapid gangrenous destruction of the growth occurs, often a mitigation of suffering ensues. Pains at an early period are due to peritoneal irritation or to local peritonitis. In advanced stages peritonitis is rarely absent. When the cancerous infiltration invades the uterus pains ensue, consequent, it is presumed,

upon injuries and alterations in the uterine nerves. Cornil,[1] who has made a special study of the nerve-lesions, states they are primarily seated in the neurilemma and perinerve, the nerve-tubes being only secondarily affected. They may present in the uterus the following varieties: 1. The neurilemma is transformed into tissue similar to that of the epithelial neoplasm in which it is imbedded, and from which it cannot be enucleated; 2. The nerve-trunks can be easily separated from the neoplasm with which it has formed no attachments. It is then found to present in its course fusiform or spherical enlargements, due to hypertrophy and hypergenesis of the neurilemma. Of the two varieties, the latter is the most common. In both, when the neurilemma is extensively affected, the medullary substance of a portion of the nerve-tubes is always found to have undergone granular degeneration, but the degeneration was never anything but partial. This preservation of the larger number of nerve-tubes explains the symptomatology of these tumors, which occasion pain and not paralysis. In certain instances, it is true, the power of locomotion has been found to some extent impaired, but this was where there was accompanying œdema of the limbs, and was not due to the lesions of the nerves alone. Patients, it may be mentioned, sometimes complain of subjective sensations of heat or cold in the painful member, while in reality the temperature does not differ from that of the healthy limb.

In the progress of uterine cancer certain accidents are liable to occur which are only indirectly the results of disease, but which are yet of primary importance, not only as regards symptoms, but as frequently involving life itself.

Thus the compression of an artery by the growing tumor may give rise to thrombi. Venous thrombi are, however, much more frequent than arterial, and are found in about a third of the fatal cases. They may be due to compression, or large veins may be perforated, and a portion of the tumor, coming into direct contact with the blood, may cause coagulation. In this way veins may be obliterated, but the larger the vein the longer the circulation continues, and, as the ingrowths are soft, they become pedicled by the washing of the blood in the calibre of the vessel. They become augmented in size by the deposit of coagula about them. Thrombi further owe their origin to the general marasmus almost always present in the last stage of cancer, and to the weakened action of the heart, resulting partly from fatty degeneration and partly from the frequent recurrence of profuse hemorrhages. Venous thrombi may involve not only the utero-vaginal and vesical plexuses, but may extend to the crural and iliac veins. As a consequence of the stoppage of the vessels there may result œdema of one or both extrem-

[1] "Sur la Production des Tumeurs epithel. dans les Nerfs," *Robin's Journal*, 1864. p. 185.

ities, usually of moderate intensity. This is not, however, the only cause of œdema, as very many cases seem traceable to the hydræmic condition of the blood. Among the more remote consequences is the migration of emboli to distant parts, of which the lungs are the most frequent point of lodgment, when they may give rise to pulmonary œdema and to lobular and lobar pneumonia.

Peritonitis rarely fails as a complication. It is usually of a chronic character, and is followed by the formation of adhesions, which frequently act as a conservative provision, protecting the peritoneum from perforation. Owing to the contiguity of the diseased structures, peritonitis is most common in the cul-de-sac of Douglas and vicinity, but it may arise from softening and destructive changes in the secondary formation in the coats of the bladder, rectum, Fallopian tubes, and in the pelvic glands, or it may result from consecutive diseases of the same tissues not of a cancerous nature. Acute peritonitis seldom occurs as secondary to the chronic form, but results from the passage of septic products through the tubes from perforation of the uterine walls or from rupture of abscesses into the peritoneal cavity. Either of these occurrences is necessarily followed by speedy death.

The invasion of the vagina is frequently attended with inflammation of relatively healthy portions, with swelling of the vulva, and sometimes with intense pruritus. The extension of the inflammation to the bladder and rectum gives rise at an early period to cystitis and catarrhal affections of the lower bowel, with painful urination and defecation and enlargement of the hemorrhoidal veins. Blau found in 93 cases of cancer observed in the Pathological Institute of Berlin 10 cases of pyelo-nephritis.

Cancerous invasion of the bladder by extension from the vagina and the pelvic connective tissue was observed by Gusserow 128 times in 311 cases, and in 56 of these the invasion was followed by the formation of fistulæ. In many instances there were associated not only the symptoms of catarrh of the bladder, but deep-seated diphtheritic inflammations and ulceration of the vesical mucous membrane.

Partial and complete occlusion of the ureters, due to pressure exerted by cicatricial thickening of the connective tissue, to cancerous infiltration, and in rare instances to extension of cancerous products to the ureters, have been frequently remarked. As a secondary result, dilatation of the ureters, the pelvis, and calyces of the kidneys, with varying degrees of hydro-nephrosis, are in advance stages of uterine cancer of common occurrence. Blau in the report already referred to found this condition in 57 of the 93 cases he examined. Seyfert was accustomed to assert that uræmia from this source was the ordinary cause of death in late stages of the disease.

Sometimes the kidneys are atrophied, but generally they are pale,

globular, anæmic, and semi-transparent from distension by retained excretory products. In rare cases we may find albuminous nephritis or pyelo-nephritis, with the pelvis and calyces filled with thick, cheesy pus. It is a singular fact that in fatal cases of uræmia, uræmic convulsions, even in cases of total suppression, are rarely present. Cornil[1] remarks: "With these obstructions to the excretion of urine we expected to find uræmic symptoms to be manifested, but they were not. Although the attention of M. Charcot and myself was fixed upon this point, we saw neither the epileptiform convulsions nor the coma peculiar to uræmic poisoning." Sometimes the ureters are relieved from pressure, and the anuria ceases after the destruction of the trigonum vesicæ and the formation of a vesico-vaginal fistula.

Gusserow reports that in 282 cases the rectum was implicated 53 times, with 37 recto-vaginal fistulæ.

Metastases to remote regions are extremely rare, but they occur in the peritoneum, mesenteric glands, kidneys, lungs, liver, pleuræ, and stomach.

Disturbances of digestion occur as early symptoms. With obstinate constipation there is usually chronic catarrh of the stomach, anorexia, and not infrequently persistent vomiting. The latter symptom may be associated with the metastases referred to, with uræmia, or with chronic peritonitis. Gusserow lays stress upon the atmosphere which surrounds the patient as a prominent source of stomach disturbances.

In the term cachexia we have an expression for the general condition of the body to which the disease leads. Hemorrhage induces anæmia and hydræmia, the products of decomposition are absorbed into the system, the processes of assimilation and nutrition are impaired by the deteriorated condition of the blood, and as a result the patient becomes thin, wan, yellow, and wrinkled. As these consequences do not occur so long as the tumor remains local, we are justified in assuming that the deleterious influence upon the organism is due not to any specific infecting property of the tumor itself, but to the necrotic changes it undergoes.

Marasmus is the most frequent occasion of the lethal ending; thrombosis of the veins, dysentery, bed-sores, and diphtheritic inflammations of the bladder and the rectum frequently, however, contributing to the fatal result. Purulent peritonitis is another common cause of death. In 93 cases already referred to which were reported by Blau, 48 deaths resulted from exhaustion, 27 from peritonitis, 11 from pneumonia, 3 from pleurisy, and 3 from pulmonary emboli; but the statistics of Blau were based upon observations made upon cancer in different organs of the body, and are not confined to the malignant affection of the uterus. In Säxinger's report from Seyfert's clinic of 62 fatal

[1] *Loc. cit.*, p. 647 *et seq.*

cases of uterine cancer, the following additional causes of death are given—viz. 9 from pyæmia, 5 from amyloid degeneration of the kidneys, 3 from œdema of the lungs, 3 from dysentery, and 28 from uræmia.

In cancer of the body of the uterus the hemorrhages are the most conspicuous symptom. They occur commonly at the end of menstrual life or years after the menopause. At first they are often preceded by mucous discharges and possess an intermittent character.

If the uterine cavity is enlarged and the cervical canal is closed, the retention of disintegrated portions of the growth may give rise to a stinking discharge, but when the walls are of normal thickness and the new formation is superficial, no odor may be perceptible.

In advanced stages of the disease intermittent pains due to uterine contractions are common when the growth fills the uterine cavity. The periodic character of the pains is partly explained by the repose which follows the expulsion of the diseased tissue. Intermittent pains are usually absent in cases where the disease is nodular and tends to growth in the direction of the periphery of the organ.

Cachexia is a late symptom in cancer of the uterine body. As in cervical cancer, uræmia, bladder troubles, and symptoms of rectal compression occur, though perhaps with lessened frequency.

Diagnosis.—The success of surgical measures for the radical cure of cancer has rendered it a matter of great importance to recognize the disease in its early stages while operative measures are still practicable—*i. e.* before the invasion of the connective tissue adjacent to the uterus. At the present time all the older signs by which it was thought practicable to distinguish prior to ulceration benign from malignant forms of disease are no longer regarded as conclusive, and the microscope alone is relied upon to determine the nature of suspicious growths. Since this has become the rule, cases of cure of uterine cancer consequent upon the removal of the vaginal portion, formerly so common, have ceased to be reported. A hard, swollen, nodular condition of the cervix, associated with menorrhagia or metrorrhagia, is not necessarily diagnostic of cancer. It should, however, prompt to the excision of a sufficient portion of the diseased tissue to render a satisfactory microscopical examination available. Intracervical nodules are difficult to distinguish from old cervical catarrhs. Schroeder declares that in cases of great hypertrophy of the portio the presence of the ovules of Naboth are of good omen.

It is extremely rare, however, for the attention of physicians to be called to the existence of cervical cancer previous to the occurrence of ulceration. A papillary outgrowth seated upon a broad base is cancerous. In the case of a small ulcer with papillary projections the diagnosis is sometimes uncertain. Stratz, however, insists that in the

malignant form the borders of the ulcer are sharply defined, the surface has a granular appearance; and he lays great stress on a yellowish tint and on glistening whitish-yellow elevations as characteristic. Schroeder lays stress on the presence of a zone of follicles encircling a papillary ulcer as an indication of benignancy, but it is to be borne in mind that every papillary ulcer has a tendency to become cancerous.

In advanced stages the diagnosis is easy. The hard surface, the indurated borders, the deep cervical excavations, or the proliferated masses springing from the base, the brittle character of the growth, the necrotic shreds, the stinking ichorous discharges, the associated hemorrhages, the losses of vaginal substance, the infiltration of the pelvic connective tissue, the fixation of the uterus, and the general marasmus, are sufficiently conclusive. Only a superficial examination would confound these conditions with those which exist in sloughing fibroids and diphtheritic ulcers.

In the so-called cauliflower growths excision and the resort to the microscope are essential for the diagnosis, though a benign papilloma assuming the cauliflower form is of altogether exceptional occurrence. When symptoms point to the probable existence of carcinoma of the body, the curette should be resorted to and the existence of a growth determined. The scrapings should then be tested by the microscope.

Treatment.—The treatment of uterine cancer consists in the employment of curative or palliative measures. The aim of treatment should of course be the complete freeing of the patient from the frightful malady with which she is afflicted. Cure can only be effected by the removal of every particle of diseased tissue. Whether this can best be accomplished by the extirpation of the entire uterus, or whether in selected cases partial ablation furnishes a safer and at the same time an equally satisfactory procedure, is a matter still *sub judice*.

The first case of vaginal hysterectomy for uterine cancer was performed by Sauter of Constance in 1822.[1] His method consisted in the separation of the cervix from the vagina by a circular incision, the opening of the anterior cul-de-sac, the separation of the uterus from the broad ligaments and tubes, the forcible anteversion of the uterus, and finally the division of the posterior attachments. The patient lost a pound and a half of blood, but made a complete recovery. Death from œdema of the lungs occurred four months later.

Blundell in 1828 opened first the posterior cul-de-sac, and then the anterior vaginal vault. Next he retroverted the uterus with a double hook, and dragged the fundus down to the coccyx. The operation was completed by the separation of the lateral uterine attachments. The

[1] According to Hegar and Kaltenbach, the operations of Marshall (1783) and of Langenbeck (1813) were performed upon the prolapsed uterus, and the diagnosis of cancer was doubtful.

patient died at the end of the year of carcinomatous stenosis of the rectum.

Récamier in 1829 modified the operation of Sauter by dividing the upper two-thirds of the broad ligaments only, while to the lower third, including the uterine artery, he applied ligatures. At the end of thirty-four days the patient was pronounced cured.

In 1850, Prof. Paul F. Eve excised a carcinomatous uterus from a negress twenty-eight years of age. He ligated the left uterine artery, which bled profusely. A solution of sulphate of zinc was applied to restrain further hemorrhage, which had been considerable. The patient returned to her home on the seventeenth day. The disease recurred, and the patient died of hemorrhage three months and a week after the operation.[1]

Hegar likewise refers to successes obtained by Kieter (1848) and by Hennig, but as a set-off to these rare instances of recovery there were upward of thirty operations in which death speedily followed from collapse, hemorrhage, or peritonitis.

In 1878, Wilhelm Alexander Freund[2] published a successful case of uterine extirpation for cancer made from above through an incision in the abdominal walls. The operation was performed on the 30th of January. After carefully washing the uterine cavity with a 10 per cent. solution of carbolic acid, and emptying the bladder and rectum, an incision was made through the linea alba, extending from the symphysis pubis to three fingers' breadth below the navel; the intestines were lifted from the pelvic cavity, and, wrapped in a carbolized towel, were laid upon the abdominal walls; a ligature was passed through the fundus, by means of which the uterus was drawn upward; three ligatures were then passed through the broad ligaments upon each side, the first penetrating the substance of the tube and that of the ligamentum ovarii; the second, the ligamentum ovarii and the round ligament; the third one, the round ligament through the vagina, and returning so as to include the base of the broad ligament. After tying the ligatures tightly the uterus was removed by first separating the cervix from the bladder, then opening the cul-de-sac of Douglas, and finally dividing the broad ligaments next to the uterus. The threads were then passed through the aperture into the vagina and drawn downward. As this was done the pelvic peritoneal folds above were brought into contact, and were closed by a series of button sutures. Freund's great merit consisted in the systematic application of ligatures to control hemorrhage. But the method of Freund in practice did not prove successful. In 1881, Hegar and Kaltenbach published a summary of

[1] A. P. Dudley: "Vaginal Hysterectomy in America," *N. Y. Med. Journ.*, July 9 and 16, 1887.

[2] *Volkmannsche Sammlung*, No. 133.

results to that time. In 93 operations there were 63 deaths. But meanwhile Schroeder was practising the high excision of the cervix after detaching the cervix from the vagina and bladder and tying the uterine arteries in the broad ligaments. Rydigier proposed in 1880 to combine this method with that of Freund. Bardenheuer carried this suggestion into practice, and, in place of closing the aperture left after removal of the uterus, introduced a drainage-tube through the vagina. He likewise abandoned the ligatures *en masse*, substituting for them special ligatures to each bleeding vessel which was exposed in dividing the broad ligaments. Of 12 patients operated upon, 9 recovered. Thus, step by step, the way was prepared for the vaginal method of extirpation, the success of which has finally led to the abandonment of the abdominal operation.

The pioneer in the new path which had thus been marked out through the labors of many workers in the same field was Czerny. On the 12th of August, 1878, the Heidelberg surgeon removed the uterus through the vagina, applying ligatures to the severed vessels as a preventive measure against hemorrhage. His patient recovered. The perfecting of the procedure we owe to Schroeder, Olshausen, Leopold, Martin, Freund, and others in Germany. In our own country the work has been followed up with special success by Fenger, Polk, Cushing, Lane of San Francisco, and Bernays of St. Louis.

The extirpation of the uterus *per vaginam* is only indicated in the early stages of cancerous disease. To be of avail it is necessary that the uterus should be movable and the parametria free. It is of great advantage if the cervix can be drawn down by volsella to the pelvic floor. To determine these points the patient should be examined under an anæsthetic after preliminary evacuation of the bowels. Shauta mentions as a contraindication an infiltration of the pelvic cellular tissue around the uterine arteries, forming a firm, rigid cord recognizable by the finger upon rectal exploration. The non-observance of these rules can only be followed by an enormous increase in the mortality rates, and result in bringing the operation into disrepute, owing to a speedy recurrence of the disease.

Preliminary treatment consists in the administration of bismuth and laxatives for several days previous to the operation to counteract flatulence and to render the abdomen soft and compressible; in full baths to promote activity of the skin; and in thorough disinfection of the vagina by irrigations with corrosive-sublimate solution in the proportion of 1 : 1000.

At the time of operation the external genitals should be shaved and cleansed with soap, ether, and bichloride solution. Leopold recommends the introduction of a tampon into the anus. Necrosed tissue and pus-collections should be scraped away with the curette, and a 5

per cent. solution of carbolic acid should be thoroughly applied to the morbid growth and to the folds of the vagina.

Amputation of the cervix is only advisable when the size of the tumor interferes with the field of operation. Leopold, however, recommends scooping away the diseased tissue with the sharp spoon from the vaginal portion at the time of operation, introducing ligatures if necessary afterward to restrain bleeding, and employing means to carefully disinfect the utero-vaginal canal. Tauffer, after removing the cervix, curetting diseased points, and employing the actual cautery, applies chromic acid and chloride-of-zinc solutions to the stump for ten or twelve days previous to the operation, until a clean surface is produced. The success of other operators who warn against such measures, owing to the possibility of promoting the extension of the disease by opening up the lymphatics, is evidence, however, that preliminary amputation is not indispensable.

Operation.—In the performance of the operation the patient is usually placed upon the back with the hips everted, or in the lithotomy position. In either case the thighs should be brought well over the edge of the table.

Short, broad specula, modelled after those of Sims or Simon, are employed to expose the vaginal vault. Long specula, by preventing the descent of the uterus, increase the difficulty of the operation. Usually two specula, one to hold up the anterior and one to depress the posterior vaginal wall, suffice. Sometimes during the progress of the operation it has been found convenient to substitute for the latter the fingers of an experienced assistant. Exceptionally, blades for the lateral walls are required, or forceps may be employed to draw the labia outward. Fritsch has perfected a speculum for the anterior wall by means of which the field of operation is continuously irrigated with a 1 per cent. solution of carbolic acid.

A description of the operation is rendered difficult by differences in details in the practice of surgeons of the largest experience and reputation. When the parts have been properly exposed the vaginal portion should be seized with volsella forceps, and a circular incision made through the vaginal attachments. Usually, the incision is completed in two separate acts. Thus, either the anterior lip is seized, the uterus drawn forcibly downward, and a semicircular cut made in front above the seat of disease, to enable the operator to proceed at once to the detachment of the bladder from the uterus, or the volsella are made to seize the posterior lip, the cervix is drawn upward, and a semicircular cut is made first behind at the vaginal attachment with the intent of at once reaching the cul-de-sac of Douglas. Fritsch, on the other hand, begins with lateral incisions and ligates at the outset the vessels in the base of the broad ligaments. The advantages of this method, he

maintains, are the arrest of all hemorrhage previous to opening the peritoneum, the increased mobility imparted to the uterus, and the possibility of arresting the operation in time in case the parametria are found to be invaded and total extirpation therefore purposeless. Martin pronounces these trifling variations in the technique to be immaterial.

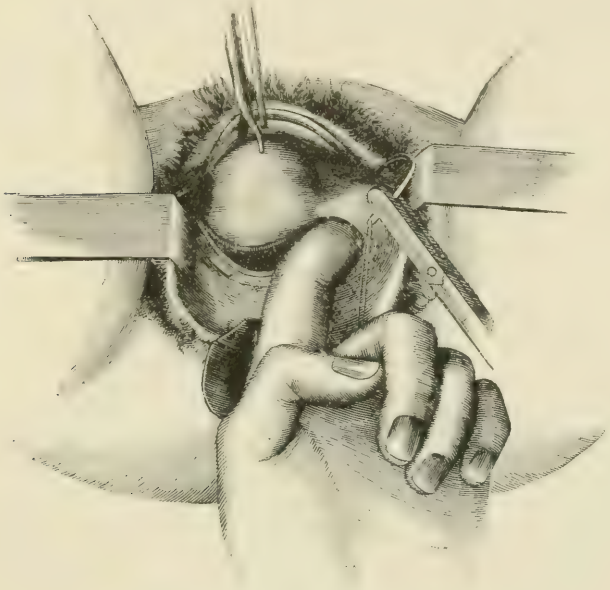
From the first employment of the knife to the opening of the peritoneal cavity irrigation should be either continuous or at frequent intervals.

The detachment of the cervix from the bladder-wall is accomplished by the fingers while the vaginal portion is drawn downward and backward. Pains should be taken at the outset to find the intercellular layer. The separation is usually not difficult. It may become so if the cellular tissue is found to be invaded by cancerous nodules or if the fingers are kept too close to the uterus, so that they make their way beneath the external muscular uterine layer. The extent of the connection between the bladder and the cervix varies greatly in different cases. In some instances, according to Martin, it does not exceed half an inch; in others it may extend halfway upward over the body of the uterus. The opening effected should not be too narrow. By detaching the bladder for a sufficient extent laterally there is less risk of the ureters becoming involved in the ligatures applied to the broad ligaments. There need be no difficulty in recognizing the peritoneum after the bladder detachment has been completed. In cases of doubt its glistening surface can be brought into view by lifting the bladder surface upward. Before proceeding farther all hemorrhage should be checked. Martin accomplishes this by silk ligatures passed from the vaginal wall near the cut surface around the bleeding tissue and returned to the vagina, so that when tied they run parallel to the cut border. Sometimes the hemorrhage is so slight that a stream of hot water suffices for its arrest.

The opening into the cul-de-sac of Douglas is usually easily effected. The cervix is drawn upward, and the incision already referred to is made at the vaginal insertion. In some instances the peritoneal sac is at once laid open. In others it is necessary to detach tissue of considerable thickness. If in the latter case there is troublesome hemorrhage, it should be controlled by interrupted sutures passed around the bleeding mass from the vaginal surface parallel to the vaginal cut. The peritoneum presents the appearance of a delicate glistening membrane. This should be incised and the opening enlarged. Martin at this point passes his finger into the cul-de-sac and presses the peritoneum downward. Under the guidance of the finger he stitches with curved needles the peritoneum to the vagina with sutures introduced parallel to the cut surface. Leopold employs sutures at the angles of the wound

only, guiding the needle serving for their introduction to and across the cul-de-sac of Douglas, returning the ends to the vagina, so that when drawn upon they approximate the outer borders of the cut surface. To

FIG. 195.



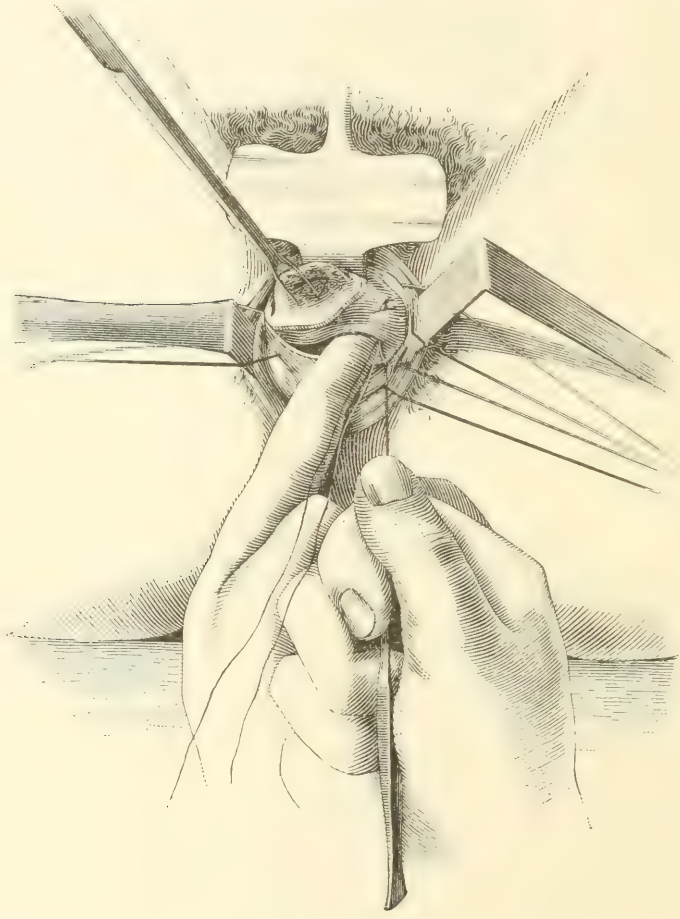
Sewing the Floor of the Pelvis (Martin's method).

prevent prolapse of the intestines a sponge the size of an English walnut, to which a silver wire has been attached, should be pushed up behind the uterus.

In this way, with the exception of the anterior peritoneal reflection, the uterus is separated front and rear. The speculum used to depress the perineum is next removed. An assistant draws the uterus strongly to the right side with volsella or with a ligature passed through the vaginal portion. The operator introduces the index finger of the left hand into Douglas' cul-de-sac and presses the left broad ligament from behind forward. The finger helps not only to bring the parts within easy reach, but serves as a guide to needles employed in the introduction of the lateral ligatures. These are intended to close the vessels in the base of the broad ligament, including the veins and the uterina with its branches. They should be of strong silk, and should be carried through the tissues by means of an aneurism-needle or a curved needle grasped by fine forceps. The first ligature should be inserted below near the uterus, and should be firmly tied. The ends should be left long. The tissue next to the uterus should be divided with scissors.

Then, still under the guidance of the finger, a second ligature is passed above the first, and the tied portion separated from the uterus. The amount of tissue included in each ligature should be small to ensure adequate compression. Thus step by step the vessels are secured from below upward until the point is reached where the folds of the broad ligaments are in immediate contact, and where, consequently, resistance to the finger ceases. For greater safety, each succeeding ligature should

FIG. 196.



Leopold's Method.

partially overlap the territory of the one immediately below. Then the uterus should be drawn to the left, and the same process should be repeated on the right side. At this stage the uterus is detached front and rear, with the exception of the anterior peritoneal reflection, and is held at the sides by the tubes and upper folds of the broad ligaments only.

In its final removal Leopold prefers to leave the uterus *in situ*, and continues the lateral ligatures upward until the tubes, with the ovarian artery, have been tied and separated. Then he withdraws the sponge from the cul-de-sac of Douglas, which is recognizable by the silver wire attached to it, and inserts in its place a sponge upon a sponge-holder. Finally, a ligature is placed around the plica vesico-uterina, and the detachment is thus completed. Leopold reports but 3 deaths in 48 operations.

Martin's method differs from that of Leopold in that he prefers, after having detached the base of the broad ligaments upward to the sides of the uterine body, to retrovert the uterus and drag the fundus through the opening in the cul-de-sac of Douglas into the vagina. He then ligates the tubes and ovarian artery and the vessels of the pampiniform plexus in successive portions, and divides the tissues next to the uterus until the line of separation below has been reached.

The retroversion and dragging the fundus of the uterus into the vagina is often difficult. It is accomplished by drawing the cervix forward and depressing the hollow of the fornix. The posterior surface of the body is seized with bullet-forceps or the forceps of Muzeux, and as it comes into view other forceps are inserted nearer the fundus until the latter passes through the posterior opening. As regards further matters of detail, Martin, after tying the tubes and the portions of the broad ligaments lying near them, cuts away the uterus. There remains then below quite a thick mass of tissue to the sides of the uterus. These he ligates, but before severing them he stitches them to the vaginal wound. Before separating the peritoneal connection with the bladder he stitches the peritoneum to the vaginal wound in front.

Fritsch's method consists in first dividing, portion by portion, the parametria, and tying, as they are exposed, the vessels in the base of the broad ligament upon each side. He then opens into the anterior cul-de-sac and draws down the fundus of the uterus anteriorly into the vagina. A sponge is introduced in front to prevent descent of the omentum or intestines. After ligating and completing the separation of the broad ligaments he cuts away the posterior attachment and unites the peritoneum of Douglas' cul-de-sac to the vagina.

These three methods have been given in detail, partly because of the exceptional fame and experience of the reporters, but chiefly because they represent distinctive peculiarities in the operative procedure. Many other slight variations have been advised by others, but they require no special mention because they pertain to the individuality of the operator and are non-essential.

After the uterus has been withdrawn the ligatures should be made tense, and the tubes and ovaries, if accessible, should be ligated and removed. Every point in the severed tissues should be examined with

the utmost care, and all bleeding points should be tied. It is upon the pedantic observance of this rule that the subsequent safety of the patient depends.

Martin inserts a large rubber drainage-tube into the cul-de-sac of Douglas, the outer end of which he turns back into the vagina, and introduces a large compress of salicylated cotton to close the vaginal orifice. Others content themselves with sprinkling the stumps with iodoform, and, after cleansing the vagina of all blood, with filling the vaginal passage with iodoform gauze.

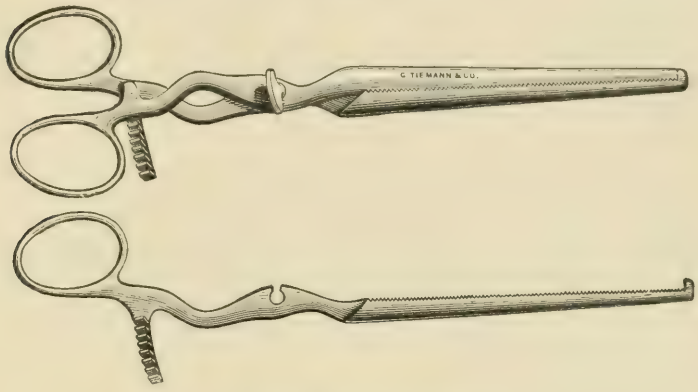
The subsequent treatment consists in complete mental and physical repose, in the maintenance of the pulse, and in the early administration, at short intervals, of small quantities of stimulants and fluid food. Urination is usually spontaneous. The bowels should be moved at the end of the week. The tampon of iodoform gauze should be withdrawn from the ninth to the tenth day. Only in cases of marked disturbance of temperature should earlier removal be resorted to. Usually, the patient behaves like a woman during the puerperal week. At the time the tampon is withdrawn the roof of the vagina is covered with red granulations. The stitches should be removed from time to time after preliminary irrigation of the vagina. The granulations should be carefully dressed with iodoform after each examination. The patient is usually able to sit up between the second and third weeks. Fritsch states that the average time of his patients in hospital was only two weeks. The safety of the woman after extirpation of the uterus is the result not of special therapeutical devices, but depends upon strict antisepsis and the careful control of hemorrhage at the time of operation.

In the vaginal extirpation of the uterus as commonly performed the chief difficulty encountered consists in the means employed to prevent hemorrhage from the broad ligament.

The prolongation of the operation which results from the use of ligatures is not without its effect upon the prognosis. In France, at the instance of Richelot, pressure-forceps, designed to grasp the entire width of the broad ligament, have been tried with satisfactory results. Doléris estimates that with the old method the deaths in France were in the proportion of one to three, whereas with forcipressure scarcely any but successes have been recorded. Doléris himself has recently devised a forceps-clamp, the blades of which are capable of separate introduction, and which lock after their adjustment in the manner of obstetrical forceps. One blade is somewhat longer than its fellow, and the extremity covers that of the latter in such a way that slipping downward after the two have been adjusted is rendered impossible. He reports two cases in which they were practically tested with entirely favorable results. He advises stripping the uterus from its attachments front and rear to as slight an extent as possible, and the appli-

cation of the clamps under the guidance of the finger as near to the uterus as possible. The blades should be removed at the end of thirty-six hours, by which time all danger of hemorrhage is over. Etheridge in

Fig. 197.



Doléris' Pressure-Forceps.

this country has recently indorsed forcipressure as a valuable resource in the performance of vaginal hysterectomy.

The legitimacy of total extirpation in the treatment of carcinoma uteri is no longer called in question. Martin, in a paper read before the gynecological section of the Ninth International Medical Congress, gives a list of 311 operations performed by six experts up to 1886, with 47 deaths, a mortality of 15.1 per cent. Dr. Sarah E. Post furnishes a table containing 722 operations, with 170 deaths, a mortality of 24 per cent. But in judging the true status of an operation we are not to be governed by the results obtained by aspirants who enter a new field without either proper equipment or training. The decision depends upon what is shown to be capable of accomplishment by those who undertake surgical work only after suitable anatomical preparation and forearmed against the difficulties to be encountered.

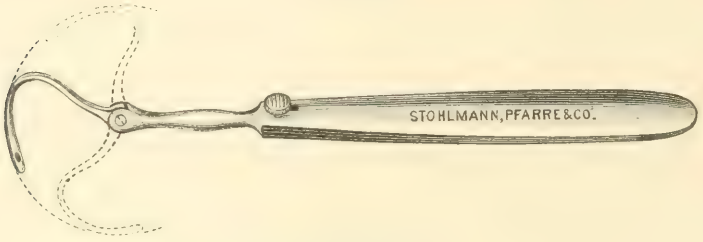
Vaginal Hysterectomy: Method of Prof. Polk of New York.—"The method which I have found best to pursue in operating in these cases is the following:

"A preliminary cleansing of the external parts is done by the assistant, soap and water and a 1 : 2000 solution of bichloride of mercury being used. The same assistant then cleanses the vagina and cervix with the same mercuric solution.

"I then seize the cervix with a volsellum forceps and drag down the uterus as far as it will readily come. Strong silk ligatures are then passed through the vaginal roof, one on each *side* of the cervix, the modified aneurism-needle devised by myself being used for that purpose. These ligatures are passed from before backward, and the point

of the needle carrying them is made to penetrate as high as the level of the internal os, if possible, before giving it the backward sweep. In this way the lower branches of the uterine artery, and sometimes the main artery itself, are secured. These ligatures are then firmly tied and cut short. It may be said that this ligation is the only one which is liable to involve the ureters. (If, however, the ligatures are entered at the front, inside of the well-known region of the ureters, and are then passed backward, as I have described, these canals will never be

FIG. 198.



Prof. Polk's Needle, with joint permitting change of direction, for introducing sutures into the broad ligaments.

injured; they are well removed from the postero-lateral regions of the uterus.)

"A free incision is next made through the vaginal roof inside the ligatures upon both sides; the finger is introduced, and as much of the cervix is enucleated as may be without entering the peritoneal cavity. The vaginal wall is next cut away from the cervix anteriorly and posteriorly, and the cervix cut off as high up as the enucleation has been carried. The object of this amputation is to get rid of all the septic tissue, or as much of it as is possible, before opening the peritoneal cavity. It serves the additional purpose of clearing the field, so that even in a case where the disease is confined to the body I should do it, unless I should find that by so doing I would open into the ulcerating cavity of the organ.

"The stump of the uterus is then seized with the volsellum and continuous traction maintained as before. I now cleanse the vaginal stump and adjacent tissues with the solution of bichloride of mercury (1 : 2000), as before, submitting my own hands, and especially my nails, together with those of my assistants, to the same agent. All sponges and instruments which may have been in use up to this time are laid aside and fresh ones substituted. All this is done quickly, the necessary appliances being at hand.

"The peritoneum is now opened in Douglas' cul-de-sac, and, passing one jaw of a stout hæmostatic forceps into the opening, the bases of the broad and utero-sacral ligaments at their attachment to the uterus are secured and severed, first on one side, and then on the other. This

effectually disposes of the uterine arteries, the most troublesome factors in the operation.

"The bladder is now freed from the uterus, this being a part of the procedure which may be easily accomplished; but in most cases it is one which tries the patience and skill of the operator. As soon as this is done I search for the ovaries and the free ends of the tubes. These are brought down, and, if possible, are clamped with the uterus. If not, they are left and dealt with separately by silk ligatures. If the woman be beyond the menopause, I make but little effort to secure these appendages, proceeding at once to the clamping of the broad ligaments and the removal of the uterus.

"For this purpose I employ scissor-handled clamps with jaws two and a half to three inches long. From this it will be seen that I employ a double set of clamps—one set short in the jaws for the base of the broad ligament; another set long in the jaws for the remainder of the broad ligaments and the structures contained therein. I also employ ligatures, one on each side of the cervix, at the outset of the operation. This I believe to be the best method of securing the vessels, but in case I find that the ligatures employed at the outset have controlled the vessels enough to enable me to separate the bladder without much bleeding, I proceed at once to the separation of that viscus. Opening into the peritoneal cavity first anterior to the uterus, I then open posteriorly, and clamp the entire broad ligament with a single pair of instruments to each side.

"To recapitulate: The ligatures are to control hemorrhage incidental to the enucleation of the cervix, and possibly that incidental to the separation of the bladder. The first set of clamps are for the purpose of controlling hemorrhage which may occur while the bladder is being separated. If none occurs they are to be omitted.

"The second set of clamps are for the purpose of controlling the hemorrhage due to severing all that part of the broad ligament above the first clamps, should they be used, or the ligatures, should the first clamps be found unnecessary. If the two sets of clamps are used, I treat them alike, leaving them in position for forty-eight or seventy-two hours, as I think best.

"As soon as the uterus is cut away and the appendages disposed of, I wash out the cavity remaining with plain warm water, place iodoform gauze loosely in the peritoneal opening and in the vagina, put on a pad, and return the patient to the bed."

The question to be settled is as to the true limits of the operation. No one disputes its propriety in cases of carcinoma and sarcoma limited to the body of the uterus, and most of those who have studied the subject are disposed to concede its indication where the neck is involved. In carcinoma of the vaginal portion the question is, however, still

sub judice. Total extirpation here meets with a formidable rival in the partial ablation advocated by Schroeder, which has a host of vehement defenders. The decision depends not upon the immediate issue *quoad vitam*, but as to which method furnishes the best permanent results. The operation is, however, still too young to make statistics upon this point altogether trustworthy. Martin states that of 44 cases in his own practice which recovered from the immediate operation, 13 relapsed, and 31, or 70.3 per cent., recovered. To be more specific, in his list of recoveries 2 dated from 1880, 3 from 1881, 6 from 1882, 5 from 1883, 6 from 1884, and 7 from 1885. The history of many of his cases still remains, therefore, to be completed.

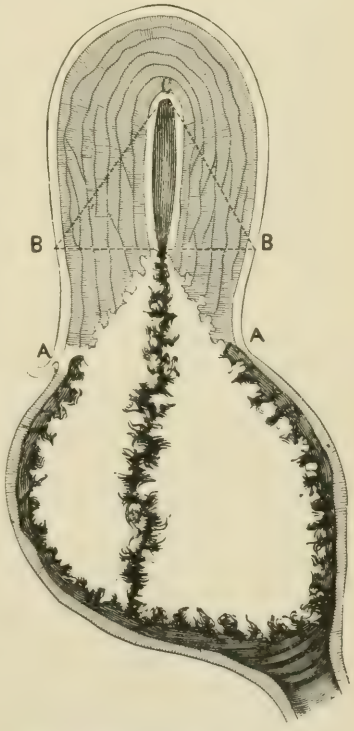
On the other hand, Hofmeier gives his own results and those of Schroeder in the University Frauen Klinik in Berlin from Oct. 1, 1878, to Oct. 1, 1886. In the eight years there were 136 partial operations, with 10 deaths (mortality 7.4 per cent.). But in the last 50 cases there were but 2 deaths, and in the last 34 no deaths. There were 74 total extirpations, with 12 deaths (mortality 16.2 per cent.). In the last 50 cases there were 3 deaths, and in the last 30 no deaths. With such a record no complaint can be made as to the timidity of the operators or to any lack of primary success. Excluding patients operated upon subsequent to Oct. 1, 1885, there were 114 partial operations, with 10 deaths; 8 cases were unavailable, 1 having died of nephritis, and the fate of 7 having been left undetermined. Of the 96 remaining cases, 47 relapsed within the year. Of 46 total extirpations, 12 died and 1 was lost sight of, owing to emigration to America. Of the remaining 33, 13 relapsed within the year. Thus, of 129 operations available for statistical purposes, 69, or 53 per cent., were known to be healthy at the end of a year. But what was the relative proportions of recoveries in the cases of partial and complete removal? At the end of the first year 51 per cent. of the partial and 63.6 per cent. of the complete cases remained well; at the end of the second year, 46 per cent. of the partial and 24.1 per cent. of the complete were well; at the end of the third year, 42 per cent. of the partial and 26 per cent. of the complete were well; at the end of four years, 41.3 per cent. of the partial were in good health, while not one of the cases of total extirpation was alive.

This curious and unexpected outcome calls for special investigation. It has not been denied, and has not been explained satisfactorily. It remains for the future either to differentiate cases requiring operation or to establish new procedures by means of which the total extirpation will furnish as favorable ulterior results as those that the Schroeder school has won by discriminating methods. Martin, however, draws attention to the fact that with increasing experience the proportion of

total extirpations increases relatively in the practice of those who most warmly maintain the utility of partial ablation.

The method of supravaginal excision, as finally recommended by Schroeder, is as follows: The vaginal portion is seized with volsella and drawn forcibly downward and backward, so that, if possible, the external os is brought to the vulva. A transverse incision is then made, about two-thirds of an inch above the seat of disease, through the vaginal wall to the paracervical tissue. The neck of the womb is stripped from the bladder with the finger to the vicinity of the anterior peritoneal cul-de-sac. The cervix should next be drawn forward, and an incision two-thirds of an inch above the disease should be made transversely through the posterior cul-de-sac. The accidental opening of Douglas' cul-de-sac is to be regarded as a matter of minor consequence. It is even necessary if especially high amputation of the cervix posteriorly is required. The lateral attachments are next separated and bleeding vessels are tied. There is no danger of implicating the ureters, because they recede as the uterus is drawn downward. Amputation is made in the neighborhood of the os internum from before backward. At first the incision should extend to the cervical canal only. Before completing the excision the anterior cervical stump and vaginal wall should be stitched together. The ligatures should be left long, and should be used after completion of the amputation to prevent recession of the stump. After removal of the posterior half of the cervix the cut surface should be covered by the posterior vaginal wall. In closing the wounds upon the sides at least one, and better two, of the sutures should be introduced deep to the borders of the uterus to check hemorrhage from vessels in the parametria.

FIG. 199.



Baker's Method of High Amputation.

Prof. W. H. Baker of Boston has modified Schroeder's operation by using Sims' uterotome after freeing the supravaginal cervix and removing a funnel-shaped portion from the uterine body, the apex of which extends nearly to the fundus of the uterus. By this means nearly one-half of the body of the uterus is cut away. The actual cautery (Paquelin's) is applied to the whole denuded surface until every bleed-

ing point is checked. The operation is best performed with the patient in the latero-prone position and with the perineum retracted by Sims' speculum. In Baker's report, published in 1886, he stated that of 10 patients operated upon by his method, none died as the result of the operation, and 6 were then living, having enjoyed a respite varying from four to eight years.

Baker regards the cautery as a most valuable means of preventing subsequent extension of the disease through the lymphatics—an opinion borne out by the excellent results obtained by Braun of Vienna, by Byrne of Brooklyn, and others with the use of the galvano-caustic wire and knife. But the necessity of special knowledge in the employment of electro-galvanic agencies has interfered with the popularization of the method.

Some years ago the chloride of zinc was advocated by Dr. Marion Sims as a destructive agent in the carcinomatous affections of the uterus, and quite recently the practice has been revived by Dr. Ely Van de Warker of Syracuse. It is possible that the caustic plan of treatment may merit a place of its own by the side of the brilliant achievements of modern surgery. It consists, according to Van de Warker, in amputation of the cervix at the vaginal junction, extending, however, with knife or scissors, the excavation to the os internum. Hemorrhage is checked by packing the cavity with masses of cotton, the size of a chestnut, soaked in a solution of persulphate of iron in the proportion of one to three of water, and squeezed nearly dry. The dressing should be removed on the second day. He then proceeds to pack the canal and the uterine cavity with masses of absorbent cotton soaked in zinc-chloride solution. Of the latter he employs two strengths—one consisting of ʒv ad ℥j, and a second containing equal parts of chloride and zinc and water. The former he uses when the uterine walls are thinned by disease, so that destruction of tissue beyond a fourth of an inch would involve the peritoneum; the stronger when the walls are normal. This point he endeavors to determine at the time of the excision of the cervix by introducing a sound into the bladder and the index finger into the uterus to gauge the thickness of the anterior uterine wall, and by a sound in the uterus and a finger in the rectum to judge of that of the posterior wall. To protect the vagina and vulva from excoriations they should be smeared previous to the use of the caustic with pomade containing one part of bicarbonate of soda to three of vaseline. After packing the canal with the zinc cotton he covers

Fig. 200.

Diagram illustrating the effects of the use of chloride of zinc, the dotted line showing extent of destruction.

the surface of the latter and about one inch of the upper portion of the vagina with absorbent cotton saturated in a 30 per cent. solution of bicarbonate of soda. The pain is often severe, requiring hypodermic injections of morphia. The removal of the packing should occur on the second or third day, when it can be done without force; but where the dressing is firmly cemented it is better to wait a day or two longer. The slough separates in five to ten days. If the strong solution has been employed, the slough is thrown off in a single piece. To avoid hemorrhage the bowels should be kept confined for four or five days, and the urine should be drawn by catheter. In using vaginal injections only a gentle stream should be employed. For hemorrhage after the separation of the slough he advises injections of vinegar. Cicatrization is completed in from two to four weeks, and is followed by marked contraction of the uterine cavity.

I have been the more particular in furnishing these details because they resemble in all essential respects the treatment of Vulliet, which has of late enjoyed considerable vogue in France. The distinctive peculiarity of Vulliet's plan consists in the removal of all accessible portions of the disease with sharp curettes, and in the preliminary dilatation of the cervix and uterine cavity by means of a packing composed of iodoform cotton introduced into the cervical canal by means of slender forceps and pushed to the fundus by uterine sounds. The cotton employed for the purpose is made into balls varying from the size of a bean to that of an English walnut. To each one a double thread is attached. They are prepared by dipping them into solutions of iodoform in ether in strengths of from 1 : 10 to 1 : 30. The milder solution he uses when the size of the uterine cavity permits the introduction of a large tampon, and the stronger one when the cavity is of nearly normal dimensions. As the ether evaporates a coating of iodoform is left upon the surface of the cotton balls. The uterine tampon is left *in situ* for forty-eight hours, at the end of which time the uterus is markedly softened and its cavity is dilated. The tampon should then be withdrawn and replaced by another. In completing the packing the second time pains should be taken to impart to the tampon a conical shape with the apex directed upward. This is effected by drawing upon the threads of the balls first placed, and holding them at the lower segment, while the following ones are insinuated at any desired elevation to secure the requisite shape. This process should be repeated at intervals of two days until the tamponing has been repeated six or eight times—until a complete dilatation of the lower segment has been accomplished and an inspection of the entire uterine cavity is rendered possible.

Vulliet's method of dilatation clears up diagnosis, permits the thorough use of the sharp curette, and enables the operator to safely apply

the actual cautery to the seat of disease. To carry out these objects an anæsthetic is usually necessary. On the following day balls of cotton soaked in a saturated chloride-of-zinc solution should be introduced with the precautions already noted. When sloughing and contraction of the entire cavity follows the use of the caustic, Vulliet advocates the subsequent removal of the ovaries in women who have not reached the change of life. The chloride-of-zinc treatment is likewise possibly available as a palliative measure in cases which have long passed the stage for radical surgery. Unfortunately, it is this class which comprises by far the largest proportion of the unfortunates who apply to the gynecologist for treatment. The early stages are often devoid of indicative symptoms, and an advanced stage is usually reached before the patient has a suspicion of the existence of a local disorder. The object then to be attained is the mitigation of pain, the control of hemorrhage, the disinfection of the discharges, and the arrest of the cancerous cachexia. That local measures, even in advanced stages of the malady, are available in retarding its progress and in alleviating its symptoms there seems no reason to question.

In the papillary form, or after ulceration has occurred, it is always an advantage to remove as much of the necrosed and bleeding tissue as possible with the sharp curettes of Sims or the sharp spoons of Simon. The ferrum candens or the cautery of Paquelin should then be applied freely to the bleeding surface. The subsequent treatment consists in abundant irrigations with detergent solutions, best made with the vulvar outlet distended by a bivalve speculum. For local dressings each one has his favorite.

Lately Mme. Gaches-Sarraute has furnished a description of the system introduced by M. Siredey in the Lariboisière Hospital. The patients are directed to present themselves at the clinic three times a week. Each one receives at the time of her visit a vaginal douche consisting of three to four quarts of the liqueur de Van Swieten (corrosive sublimate 1 : 1000) or a 4 per cent. solution of chloral. Putrid products are removed by the curette. Disk-like tampons of cotton dipped in one of the above-mentioned antiseptics are introduced into the wound, and are then covered with iodoform. A tampon of cotton is finally placed in the upper part of the vagina to hold the dressing in place. The advantages she claims for this treatment are that the pain ceases, the stench disappears, the wound becomes red and clean, the hemorrhages are checked, the vaginal lesions due to the ichorous discharge heal, the appetite returns, the icteric tint vanishes, and the patient is able to lead a family life.

Bétrin extols the advantages of terebine mixed with equal parts of olive oil or the oil of almonds, as employed by Prof. Vaucher of

Geneva. It is applied by means of small cotton tampons, which can be left in place for two or three days.

Janvrin speaks highly of the milk of Alveloz as diminishing the amount of discharge to a marked degree, and as rendering it decidedly less offensive. My own experience in its use as a local escharotic has been favorable.

I have small faith in the internal administration of drugs as a means of delaying the progress of cancerous disease. Toward the end opium is always needed, and iron, arsenic, and the bitter tonics are often useful in sustaining the patient's strength and appetite. They are of little avail, however, unless vigorously supported by thorough local disinfection.

The last days of a woman suffering from cancer are at best full of sorrow, and the hope of the future lies in the discovery of some sign or indication which will lead to the early detection of the disease, or, better still, in the recognition of the morbid states which serve as forerunners of malignant changes.

Sarcoma Uteri.

The term "sarcoma" was first applied by Virchow to a group of tumors composed in varying proportions of the constituent elements of connective tissue. According to the preponderance of fibrillæ, of cells, or of amorphous matter, sarcomas differ as regards appearance, consistency, rapidity of growth, and symptomatology. In the interior of these tumors the fibrillæ and cells present a fasciculated arrangement. The fasciculi are especially apparent upon fractured surfaces when the tissues have been previously hardened in dilute alcohol or in a solution of chromic acid.

The axis of each fasciculus is formed by a vessel the walls of which are composed of endothelial cells. These vessels are of wide calibre, often exceeding in size the largest capillaries found in normal tissue. External to these endothelial tubes a development takes place of spindle, stellate, and anastomosing cells, the nuclei of which correspond in form to that of the containing cells. In the spindle-shaped variety the nuclei are generally single, while in the stellate forms they are often multiple, the number of the nuclei being proportioned to the size of the cells. The smallest spindle cells measure from about $\frac{1}{5000}$th to $\frac{1}{1600}$th of an inch, the larger ones from $\frac{1}{800}$th to $\frac{1}{250}$th of an inch.

Ackermann[1] regards it as probable that it is from these cells that the fibrillæ are developed. The fibrillæ anastomose and enclose spaces which become evident when filled out with fluid or cell-elements. In

[1] Th. Ackermann: "Die Histogenese und Histologie der Sarkome," *Sammlung klin. Vorträge*, Nos. 233 and 234.

the younger portions of the growth characterized by the production of spindle cells the spaces contain a jelly-like amorphous substance, while in older portions, made up chiefly of fibrillæ, the gelatinous material disappears; and to this fact in sclerotic forms the seeming shrinkage is due.

Sometimes the proliferation of cells is so abundant that the tumor rapidly attains a great size, consisting in such cases of vessels and spindle cells without any corresponding development of fibrillæ. These growths possess a special malignity, due, however, not to the character of the cells, but to the rapidity with which the cells multiply.

In growths which develop slowly fibrillæ have time to form. Usually the spindle cells are there present next to the axial vessel, while the fibrillæ are found in the more peripheral portions. In time these alone may persist, when the tumor ceases to grow, and the vessels may be compressed and become obliterated by the encroachments of the fibrous tissues.

On the outer surface of the fasciculi are found broad, flat cells with rounded extremities, which hang together in the form of sheaths. These Ackermann believes to be the endothelia of lymphatics, and ascribes to them fibro-plastic properties.

Among cell-elements not forming integral constituents of connective tissue there are a number which play an important rôle in certain varieties of sarcomatous development.

In this category may be mentioned the plasma-cells, elongated nucleated bodies distinguishable from other cell-forms in connective tissue by their coarsely-granulated appearance. When present in great abundance in sarcomas they give rise to the large round-cell variety. In these tumors they measure from $\frac{1}{2500}$th to $\frac{1}{700}$th of an inch. They have large nuclei, and present the same granular appearance as in normal tissue. In the rule they are of a rounded shape, but may be polyhedral, flattened, or elongated. Certain of them possess processes due to shrinkage of the cell-body or to pressure, but the plasma-cells do not participate in the formation of fibrillæ. They are found in the neighborhood of vessels or scattered through interstices between the connective-tissue fibres. Thus, single cells or aggregations of cells may be found in meshes formed by fibrillæ. Unlike the alveoli of cancer, however, fibrillæ or fibro-plastic cells may be discovered on careful examination sparsely distributed between the plasma-cells and continuous with the fibres between which the cell-aggregations lie.

In other cases sarcomas are characterized by the presence of small round cells, which resemble leucocytes and the so-called mucous corpuscles. The small round cells may be found in great multitudes in the tissues, forming longitudinal rows between the fibres, or filling out meshes, or occupying the lymph-spaces external to the fasciculi. They

form an important constituent in the milky juice which oozes from the cut surface of the tumors.

Among other microscopic elements sometimes found in sarcomas may be mentioned giant cells containing from twelve to fifty nuclei. They are to be regarded as overgrown spindle cells.

The so-called colloid cancer is now placed in the sarcoma group, under the term "myxo-sarcoma." It owes its gelatinous consistency to the excessive development of the intercellular amorphous substance composed chemically of mucin dissolved in serum. Colloid matter is likewise found in the protoplasm of the cells on the external surface of the fasciculi. These cells, as has already been stated, are in reality endothelia of the lymph-canals.

In the uterus sarcomas may develop in the form of rather circumscribed tumors or of a diffuse infiltration.

The circumscribed sarcomas resemble intra-uterine fibroid growths. Indeed, they long bore the title of "recurrent fibroids." They usually are attached to the uterine walls, very rarely to those of the cervix. The attachment is, in the rule, broad. A true pedicle, as in fibroid polypi, is exceptional. They vary greatly in consistency. They are usually soft, like brain-tissue, or brittle, like wet mortar, or they may be as firm as a soft or even a dense fibro-myoma. They are characterized usually by the abundant presence of round cells, but the spindle cell and myxomatous forms likewise occur. A capsule is rarely present. Hegar,[1] however, describes a case with a well-defined, smooth, firm envelope composed of connective tissue. In certain well-observed instances it has been demonstrated that a fibro-myoma may become converted into a sarcoma. Rabl Ruckard describes a case of circumscribed sarcoma, with carcinomatous degeneration of the uterine walls, and scattered cancerous ingrowths in the sarcoma itself.

In the diffused form the infiltration invades the mucous and submucous layers, and sometimes the uterine walls. Gusserow[2] describes a case which traversed the uterine walls and grew into the abdominal cavity. The inner surface of the uterus presents an ulcerated appearance with fungous excrescences, and is covered with necrotic shreds. The growth is composed for the most part of small round cells, and is of a soft, brain-like consistency. As a rule, in the diffused form epithelial elements are found, so that both Klebs and Gusserow regard most of the tumors belonging to this class as a combination of carcinoma and sarcoma.

In nature the two forms are not strictly separated from one another. Of course in the circumscribed variety the mucosa and submucosa are generally affected, and the diffused variety is ordinarily associated with

[1] "Das Sarkom des Uterus." *Arch. f. Gyn.*, vol. ii. p. 42.

[2] *Arch. f. Gyn.*, vol. i. p. 240.

nodules in the uterine walls. In soft tumors disintegration is in most cases of early occurrence, so that an originally circumscribed tumor may be succeeded by a diffused infiltration.

The uterine walls are sometimes thickened, at others thinned. Occasionally they are of normal thickness. In diffused sarcoma the cervix is often dilated, so as to permit the easy introduction of the finger.

In color sarcomas are whitish, whitish-gray, or reddish-gray. They are usually extremely vascular.

As regards ETIOLOGY, little is known. Rather more than two-thirds of the cases thus far reported developed after the fortieth year. No case of uterine sarcoma is known to have occurred previous to puberty. Of 63 cases gathered by Gusserow, 25 were sterile—a proportion which strongly contrasts with the relative infrequency of cancer in women who have never borne children.

SYMPTOMS.—The early symptoms of circumscribed sarcomas are similar to those produced by uterine fibroids. Thus, the symptoms may be those of pressure, varying according to the size and situation of the tumor; the presence of the intra-uterine growth may give rise to pains of an expulsive character, and sanguinolent discharges may alternate with attacks of menorrhagia and metrorrhagia. Sarcomas are, however, softer and more brittle than fibroids; the capsule is nearly always absent; the growth of the tumor is sometimes extremely rapid; the pains are usually of excessive violence, and the sero-sanguinolent discharges may be present without the tumor's undergoing any destructive changes. In addition to these symptoms rapid emaciation and loss of strength are associated with a marked cachectic condition.

Recurrence of the tumor after removal may take place in four to six weeks, or may be delayed one or two years. The recurrent growth is more rapid in its development than the primary one, and the pains, the discharge, and the hemorrhages are intensified. Life may be prolonged by operative measures,[1] but death finally occurs from anæmia or cachectic conditions, or may result from pyæmia, from peritonitis, or from ileus. Metastases are rare, but still are more common than in the diffuse form. They have been found in the vertebræ, the lymphatic glands, the lungs, pleuræ, liver, and in the pelvic connective tissue.

In the diffused form the uterus is enlarged; its external surface is smooth. Sometimes the proliferated tissue grows down into the cervix, producing the sensation of a circumscribed tumor. That the tumor is the result of growth simply is evidenced by the absence of preliminary expulsive pains. The tissue is soft and easily broken away. Profuse hemorrhages rarely fail. At first occurring as menorrhagia, they gradually lose the menstrual type. The most violent hemor-

[1] West reports a case which lasted six and a half years.

rhages occur at or subsequent to the climacteric period. In rare cases the losses of blood are slight, but are then usually continuous. Watery discharges rarely fail. They possess commonly a disgusting odor even when disintegration is absent. As destructive changes occur the discharges become of a gangrenous character. The pain in this form is, in the rule, of extreme violence. It is unlike that resulting from uterine contractions, but is sharp, tearing, and lancinating. Metastases are less common than in the first form, but the growth has a tendency to invade neighboring organs. Thus the disease may pass through the uterus to the peritoneal cavity, to the pelvic cellular tissue, to the bladder, rectum, and vagina. The duration of the disease varies from four months to ten years; the average is about three years. In four cases inversion of the uterus has been reported.

Diagnosis.—For the foundation of a certain diagnosis the microscope is indispensable. Sarcoma may exist, and yet typical symptoms may be absent. As a rule, however, the symptoms alone suffice to render the diagnosis probable. A seeming fibroma first appearing at the climacteric, or a small fibroma which grows rapidly at the change of life, is almost certainly a sarcomatous product. Hemorrhage continuing after the climacteric is characteristic of sarcoma. Sero-sanguinolent discharges are not observed in fibromata unless associated with destructive changes. In sarcomas they occur at an early period, owing to the vascularity of the tumor and the absence of a capsule. Again, the pains are more agonizing and the tissues are softer and more brittle. The occurrence of rapid emaciation, with loss of strength, anæmia, and general cachexia, completes the diagnosis.

In diffuse sarcoma or carcino-sarcoma of the fundus the only conditions likely to be confounded with it are fungous endometritis and the benign forms of adenoma, but in both of these conditions cachexia is absent. In adenoma there is, however, often a sero-sanguinolent discharge. A dilated cervix and a tenderness of the body of the uterus point to sarcoma.

A year and a half ago a patient fifty-three years of age consulted me for profuse uterine hemorrhages. She was extremely anæmic, but not cachectic. The uterus measured four inches in length. With the curette I removed a soft growth from the fundus about the size of an English walnut. I felt sure that it was a sarcoma. Dr. Biggs, however, made a microscopic examination, and found the growth made up of proliferated gland-tubules, and pronounced it of a benign nature. The patient has since enjoyed perfect health.

A microscopic examination of mere scrapings does not always yield a satisfactory result. To determine the nature of the growth it is essential that fragments should be obtained of sufficient size to enable the observer not alone to make out the presence or absence of spindle

or round cells, but the relations of the cell-forms to the other tissue constituents.

The TREATMENT of sarcoma is the same as that of a cancer. Owing to the fact, however, that it is frequently practicable to make the diagnosis at an early period prior to the occurrence of metastases or the invasion of other organs, the opportunities for complete extirpation more frequently occur than in pure carcinoma. In the resort to palliative measures pains should be taken to avoid wounding healthy tissues, as new formations have resulted from inoculations made by tenacula employed to steady the uterus during manipulations.

LACERATIONS OF THE CERVIX UTERI.

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Introduction.—There are two kinds of laceration of the cervix uteri, the one being at right angles to the canal, commonly called rupture, the other being parallel to it.

Of the former we find numerous examples in the older textbooks; in fact, it is the laceration of the cervix which up to recent years has been the most made of; the other, which it is our purpose to consider, had been recognized from time to time, notably by Sir James Y. Simpson and Dr. I. H. Bennet, but its importance had not been appreciated by accoucheurs nor by physicians at large.

It is now universally conceded that to Dr. Thomas Addis Emmet belongs the credit of having first recognized this injury in its multiple forms and of having devised the operation for its cure.

Dr. Emmet himself tells us, in his *Principles and Practice of Gynæcology*, how he was first led in 1862 to an understanding of this condition, and to the appropriate procedures for its treatment.

Since his first paper on the subject in 1869, this lesion, its consequences, and its treatment have engaged the attention of the gynecologists of this country quite as much as, if not more than, any other one subject; and of late years its importance has been fully recognized in other countries as well, though it is remarkable, as shown by the small amount of literature contributed, how indifferently the repeated mention of its bearing on disease has been received by foreigners. Even since the matter has been taken up as a recognized entity of pathology we find but little put forth in other lands to the elucidation of any point connected with it which had not already been pretty thoroughly exposed and discussed in this country, and largely by the discoverer himself.

It is in Germany that the labors in this direction have been the most appreciated, and much work has been undertaken to verify the statements emanating from this country or to disprove the claims of those who recognize for this condition a much wider field of importance than has usually been accorded it.

In England the subject was taken up with great circumspection, and has only recently gained a permanent foothold. In 1880, at the meeting of the British Medical Association, held on Aug. 12th, Dr. Montrose Pallen of New York read a paper on "The Etiology and Treatment of Laceration of the Cervix uteri," and W. S. Playfair, M. D., presiding, is reported in the *British Medical Journal* for Sept. 4, 1880, p. 371, as expressing a fear that "on this side of the Atlantic [England] there are few who are competent to discuss the matter from personal knowledge." I believe, however, that Dr. Playfair himself, and also Dr. Robert Barnes, had at that time already operated for the repair of this injury. This is shown in a correspondence of personal character carried on in the same journal of 1886.

Something of an answer to this paper of Dr. Pallen's was prepared and read by Dr. I. Henry Bennet at the International Medical Congress, seventh session, held in London in 1881, which is reported in the *Transactions*, p. 337: "He thought the operation a totally unnecessary one, unless in some extreme exceptional case."

Dr. Playfair said on that occasion: "It has up to this time received, I may safely say, no serious study at all at the hands of British gynecologists." Dr. Playfair was, however, a marked exception, for at that time he was making a very serious study of the subject and appreciating its importance.

In France the profession has just begun to learn of the lesion and its treatment. In 1880 we find a report of one operation performed by Prof. Tarnier for the repair of the cervix, and in 1883 and 1884 two by M. le Dr. Marchand, also of Paris.[1] Fage[2] mentions two others by Dr. Peyrot. But still, in 1878, P. Budin[3] wrote: "Every one is so familiar with these fissures that we need not do more than mention them." In 1880, M. le Professeur Trélat wrote: "It is not my intention to study with you all the diseases of women, but only those in which operative interference is called for; for instance, malformations of the internal and external genitals, tumors of the uterus and annexes, ruptures of the perineum, vaginal fistulæ, etc.," and makes no mention whatever of this condition. On p. 247 of the same book he speaks of uterine disease resulting from mechanical cause, and mentions "prolapsus," but says nothing of any other. His second group he makes depend on faulty nutrition—viz. metritis, acute and chronic. He says: "In chronic metritis there are very appreciable changes in the structure of the uterus—changes which may bring about displace-

[1] L. Jacquelot in "Contribution à l'Étude des Déchirures du Col de l'Utérus," *Thèse de Paris*, 1884.

[2] Étude sur l'Opération d'Emmet." *Thèse de Paris*, 1881.

[3] *Des Lésions traumatiques chez la Femme dans les Accouchements artificiels*, Paris, 1878.

[4] *Annales de Gynécologie*, vol. xiii. p. 83.

ments. One step more, and these changes in structure, bearing as they may on one point of the organ, will deform it; for instance, hypertrophy of the neck, described by Huguier, total hypertrophy or *situated on one lip only*:[1] these hypertrophies may become considerable." He removed such an hypertrophy, "a sort of appendage springing from the anterior lip of the uterus."

A Paris thesis of 1878 by Dr. Leroty, on *Hypertrophy of the Vaginal Portion of the Neck*, although considering the questions of parturition and traumatism as causes of this hypertrophy, makes no mention whatever of laceration. Even Courty is quoted: "Sometimes, on the contrary, the hypertrophy, being most marked on the internal layers" (of the organ), "produces a rolling out of the two lips, a sort of inversion of the orifice of the neck, which spreads, opening out like a flower, showing the mucous membrane of the canal spread out on the convexity of the cervix itself."

Leroty further says: "When the anterior lip alone is hypertrophied, the orifice is thrown backward at the base of the tumor and is shaped like a crescent. If the cervix is bifid, the os is found between the two floating tongues." Again: "Hypertrophy of the cervix seems to have a most pernicious effect on pregnancy. In reading the published observations of this disease one is struck by the large number of abortions which it seems to have produced." Could anything be more descriptive of an unrecognized laceration of the cervix with ectropium?

Then, in 1879, comes the thesis of Desvernine (Paris), *Contributions to the Study of Lesions (lacerations) of the Cervix uteri*, where the whole subject is fully set out and elaborated on material obtained in New York under the clinical instruction of Sims, Emmet, and Thomas; yet in 1880 appears still another thesis on *The Hypertrophic Elongation of the Infravaginal Portion of the Neck of the Uterus*, by Dr. Curvale; and here, again, not an allusion is made to the injury.

In a general way, then, we gather from opinions enunciated during the past few years that the greatest significance is attached to this lesion in our own country, and that the operation finds among our people its strongest advocates. Next to us stand the Germans; next in order, the English; finally, the French, who are just beginning to realize the pathological bearing of the injury.

However the question may at present stand, certain it is that the greater the variety of opinion expressed the sooner will the whole subject of this injury and the operations for its repair find their just level of importance; and the more thoroughly the question is studied, the sooner will the exact sphere of these operations be defined through an understanding and consequent mastery of their difficulties.

[1] *Italics* are mine.—B. E.

The references in this article are not simply to authorities, but in many instances furnish indexes to subjects of collateral interest.

Etiology.—We cannot fully appreciate the causes of this lesion unless we divide them into the *predisposing* and the *determining*. The predisposing are those which weaken the part which gives way; the determining are those which make the part yield.

Though this is a lesion commonly associated with parturition, yet it is not confined to that state alone; consequently, we shall have to consider some few outside conditions in which it may occur, before proceeding to the study of that with which we are most wont to associate it.

We might still make one more distinction, and class the various lacerations as either surgical or obstetrical. The predisposing causes of laceration of the cervix are all those which in any way interfere with the nutrition of the part, so that it becomes less elastic than is normal, and incapable of bearing any strain which is put upon it. Such is a varicose condition of the pelvic veins, which condition is also manifest in the cervix; such are long-continued intracervical inflammations, erosions, granular and cystic degeneration of the cervix, malignant disease, and the more remote causes of strumous habit, leucocythæmia and tuberculosis; such, again, are growths within the uterine body, which in forcing their way out distend the cervix and thin its walls.

In the pregnant woman additional predisposing causes are placenta prævia, twin uterine pregnancy, monstrosities, hydramnios, pendulous belly, and deformed pelvis; lack of proper care in confinement to hasten labor or to retard it; delayed labor from any cause; rigid, non-dilatable os, and excessive uterine contractions producing precipitate labor. Previous labors, inasmuch as they may have left a fatty cervix or slight fissure, or even partial lacerations of the cervix, are predisposing causes. The same is true of breech presentations, which occur most commonly in women who have borne a number of children.

Determining causes, in general, are those which either directly produce the lesion or which are actively contributive. Such are, in the non-parturient, the sudden escape of a uterine tumor, rapid divulsion of the cervix, extraction of polypi or fibroids, and, so far as the lesion is concerned, though the appellation will differ, I may also mention posterior and bilateral section of the cervix.[1]

In the pregnant woman, abortions, accidental or wilful; excessive size of any part of the child; breech or shoulder presentation, or union of the bones of the head so that it cannot adapt itself to the outlet;

[1] See *Obstet. Gaz.*, Cincinnati, 1884, vii. p. 57: "Posterior Section of the Uterine Cervix in a Virgin for Dysmenorrhœa, followed by Serious Nervous Symptoms; relieved by Trachelorrhaphy," by T. A. Reamy, M. D.

hurried forced labor before dilatation of the os is completed; mismanagement of the forceps at any time; version in its first or third stage; labor interfered with or complicated by anything which diminishes the space in the pelvis; and all forms of violence to the cervix, notably the various obstetrical operations, and the needless meddling with the os which is frequently practised during labor to assist in its dilatation,—may be classed as determining causes.

To review some of these causes briefly: first, the predisposing. A varicose or enlarged condition of the veins of the pelvis is often to be noted in women of full habit, yet who are perhaps poorly nourished. We see it, at times, marked about the vulva, beneath the arch of the pubes, along the base of the bladder, and, following it up, we find a similar condition of the cervix.

From whatever cause this state proceeds, a change similar to that occurring in pregnancy may take place when the uterus is not pregnant, and so change the nutrition of the parts that it would require but a slight violence in the way of dilating the cervix to produce a laceration of the parts. I have seen two marked cases of this condition—one in a woman who had borne a child, but was not pregnant; the other in a young girl of seventeen who had just become pregnant through seduction: when I saw her she had missed but one period, consequently was not sufficiently far advanced to have the vessels assume the fatty change accompanying pregnancy, yet those about the vulva, especially under the urethra, were as large as goosequills, were soft, and filled up the entrance to the vagina. A similar condition prevailed within the vagina and about the cervix, so that it gave the parts an exaggerated appearance of advanced pregnancy. I did not have the opportunity to learn how she bore her parturition.

There is a time when the cervical inflammation, having distended the canal and spread down to the external os, causing erosion and degeneration, cystic and granular, so softens the part and thins out the substance of the cervix that it will readily tear through should it be put on the stretch; as, for instance, in drawing down a fibroid.

In cases of malignant disease the actual cell-structure is changed; the parts, being much modified by over-abundant blood-supply even before breaking down of the new structure occurs, are most ready to yield to any dilating force. Nor is there danger only after the occurrence of softening of the tissues. Even during the early stages of infiltration and deposit the parts, being much more rigid and undilatable than normal, are liable to rupture.

The same is true of the chronic inflammatory affections, in the early stages of which the tissues, though not yet softened, are yet quite as likely to yield to an undue dilating force on account of the loss of

normal elasticity. Therefore the chances are that an early tear will be much more extensive than one occurring in a softened cervix.[1]

Constitutional impairment, through its interference with local nutrition, may produce a weakness in the uterine tissues which may escape our attention unless the uterine discharges so commonly present with systemic diseases plainly indicate the necessity for treatment.

To pass to the condition of pregnancy, for it is here that the most important lacerations occur. We can readily understand the predisposing influence toward laceration exercised by the implantation of the placenta directly at the site of the cervix (placenta prævia). Nutrition is markedly stimulated, structural changes going on in its tissue to such a degree that the parts are more softened than they otherwise would be were the placenta engrafted elsewhere.

Apart from such an effect, we have to face the probability, at the time of delivery, of its leading to version, thus bringing into play one of the principal determining causes.

Abnormal pregnancies, as when twins, monstrosities, and hydramnios occur, act as predisposing causes, since they over-distend the uterine cavity, thus weakening its walls and entailing retarded labor; or else, through malpresentation or obstruction, uterine contractions are powerless and some obstetrical operation has to be performed.

Delayed labor may be produced in many ways, and it acts variously, both as a predisposing and determining cause; for instance, fibroids in the body of the uterus which prevent uniform, equable, properly-directed contractions, retard labor and become predisposing causes; a fibroid at the outlet, obstructing labor and causing one portion of the cervix to be much compressed and contused by being carried down ahead of the mass, becomes at once a determining cause.

Labor may be delayed by the rigidity of a non-dilatable os, which forms a predisposing cause of laceration by its tendency to induce thinning and weakness of the walls. Excessive uterine contraction then becomes the final cause of rupture. Again, when labor has simply been delayed by ordinary causes, even though the os may be dilatable, though undilated, the sudden bursting forth of the uterine contents may produce a laceration, just as if a fibroid escaped very suddenly from the cavity before the os was quite ready.

It is very essential that a proper distinction be made between the two forms of rigid os which have been described as "spasmodic" and

[1] "Observations on Laceration of the Cervix uteri; its Ætiology, Pathology, Prevention, and Treatment," by Dr. W. G. Wylie, in *Amer. Journ. Obstet.*, New York, 1882, xv. 76–102. See also discussion of paper by Drs. Garrigues and Putnam-Jacobi; the latter's remarks on œdema and its effect on unstriped muscular fibre as contributing to laceration; this event also explained by too violent contraction of upper segment of uterus before lower segment has ceased contracting, in *Med. Rec.*, New York, 1881, xx. 198.

"mechanical." In the *London Lancet* of 1860 (ii. p. 484) we find some remarks on extreme rigidity of the os uteri, in which the author, Charles D. Arnott of Edinburgh, recommends gradual dilatation by the finger, at the same time forward traction on the cervix, and, in extreme cases which resist this, division by a guarded bistoury in order to prevent spontaneous laceration of the resisting uterine tissues.

On p. 547, Dr. Fisher of Terrington holds that Dr. Arnott has mistaken his cases, and that those he describes as being "rigidity of os," when the head presses down on a segment of uterus anteriorly while the cervix is high up and closed, are really such as authors have described as of pendulous belly or anteverted uterus, and that he would be in great fault to incise in these cases, as they can be perfectly treated by position and hooking the cervix forward during the pains. In real cases of rigid os, when the cervix is tense and unyielding, thin and dry, with edges like paper, or tense and unyielding, but very thick, with rounded edges, he recommends a depressant.

He refers also to Rigby's *System of Midwifery*, p. 196, where Dr. Dewees is quoted. These both refer in strong language to the conduct of those who incise the cervix in such cases where the difficulty is simply due to the anteversion—that is, to a misdirection of the forces.

Last, but by no means least in the category, I place the early rupture of the bag of waters[1] and the escape of the amniotic fluid. This protruding segment of a sac boring the way for the passage of the fœtus and acting as a constantly present wedge, receding and advancing with the uterine contractions, is recognized as the best possible dilator of the cervix. Remove this while the os is still undilated, and we have labor arrested for a time; the dilatation of the os cannot proceed until the presenting part of the child comes down. Fortunate is the case, as to progress, if it be the head instead of a shoulder or the breech; but, at the best, this solid body making the dilatation is hard and blunt, sure to compress and contuse the soft parts against the sides of the pelvis, which fits them for almost positive rupture when the delivery takes place.

Shoulder or breech presentations delay labor and render the uterine contractions powerless, besides ultimately calling for the introduction of the hand. This, in itself, is not in any way objectionable as regards a possible laceration if dilatation is accomplished or is even possible; otherwise, such a volume thrust through a rigid os, shape the hand in cone as we will, must of necessity endanger the integrity of the parts. So it is in the third stage of version, the removal of the hand grasping the fœtal part.

In the same manner we understand how the application of the forceps, if the os be not dilated, must produce a like injury, which is especially true of the long forceps, since their use implies, of course,

[1] "Étude sur l'Opération d'Emmet," *Thèse de Paris*, 1881, du Docteur Fage (Marc).

that even the head has not come down and cannot have assisted in dilating the cervix; consequently, it cannot be very dilatable. The forceps also may do very great harm if the accoucheur after the application of the blades uses undue force and displays but little caution in making traction. The parts may yield suddenly, and he may then feel certain of having produced an extensive laceration of the cervix.

The untimely use of ergot must also be condemned, for the reason that it produces excessive uterine contractions, and thus may make the os yield before it is fully dilated.[1] It is now held by many that this drug is out of place until the uterus is empty of fœtus and secundines.

Now, for one moment, to refer to a possible cause of harm of this kind, though out of the parturient state.

It has always seemed to me inexplicable that the extensive divulsion practised by so many gynecologists now-a-days for a great variety of ills should not occasionally result in lasting injury to the cervix. A firm, unyielding tissue made to give way suddenly must rupture in some of its parts. I have seen blood from using even the graduated stem-dilators of moderate size: I have handled the divulsors in common use, even within the cervix, though I have never practised full dilatation in this manner, but I have seen many cases in which it had been thoroughly done by others, and I must say the appearance of the canal was anything but natural. I have occasionally seen a cervix which seemed to have been actually ruptured, but whether the cervical catarrh with eversion and beginning cystic disease was the result of that operation, or whether it was due to the then present pelvic inflammation, it was not possible for me to tell. Candidly, I have suspected the pelvic inflammation to be attributable to the surgical interference. Another case, however, rather more convincing, has been related to me by Dr. T. A. Emmet as having passed through his hands on the way to the grave: it is the same one mentioned in his article read in the section of Obstetric Medicine at the annual meeting of the British Medical Association in Brighton, 1886, entitled "On Certain Mooted Points in Gynecology," and published in the *British Medical Journal*, 1886, p. 910. He there speaks of a young lady brought to him during the previous spring whose cervix had been dilated two years before, and "purposely lacerated" with the object of keeping the canal open because of dysmenorrhœa (the operator, one of America's most noted gynecologists). Dr. Emmet discovered an old peritonitis, and the patient told him she was very ill after the operation from an attack of inflammation, and never regained her health. In the cleft of a triple laceration Dr. Emmet discovered an epithelioma, which developed so rapidly in a few days that he feared any operation might prove of little

[1] "Can Lacerations of the Cervix uteri be Prevented?" W. M. Polk, M. D., in *Trans. Am. Gynec. Soc.*, Philada., 1881, vi. 407–412.

benefit. Since that writing the young lady died from spread of the disease.

Pathological Anatomy.—The gross appearances of a lacerated cervix will be fully set out when we come to consider the question of diagnosis. We shall here, however, study somewhat more minutely what is going on in the tissues apart from that which is discernible by the touch and the naked eye.

As soon as the laceration has occurred, there is, of course, an open wound, which heals more or less rapidly according to the greater or less amount of cleanliness maintained.

Should the opposing surfaces be in coaptation, the parts being kept reasonably clean, union by first intention takes place, and, should this occur along the whole line, it may be that no trace of laceration will be found, not even a thread-line to indicate the site of the lesion.

Such perfect union is, however, rare. We generally find fissures about the crown of the cervix running up into the canal, with indurated tissue between the nodules; or a more positive solution of continuity on one side or both of the cervix, with a decided mass of new formation filling up the gap at the angle of repair; or, perhaps, a complete destruction of one portion or another of the cervix from sloughing, with rolling out of the cervical mucous membrane, the exposed portion being covered over by an erosion or abrasion, and frequently by enlarged and diseased follicles.

In short, we may consider four different points which bear on this condition: cicatricial tissue, eversion or ectropion, erosion, and cystic degeneration.

The cicatricial tissue, when found in an angle as a result of union by granulation or secondary union, will be more or less thick according to the separation between the opposing surfaces, tapering from the most gaping portion up into the extreme angle of the wound, and more or less dense according to the time which has elapsed since the occurrence of the injury.

This tissue is held to be cicatricial from analogy largely, also from its behavior in producing contraction and distortion of the neighboring parts, and from its character as felt under the knife.

Microscopic studies do not show us anything more positive than a condensation or packing together of fibres which may be new in their formation, or a conversion of the normal tissue of the cervix at that point.

In some cases we find, on inspection by the microscope, that these packed bundles of fibrous tissue are not confined to the angle of repair alone, but have also formed in the immediate neighborhood, in small patches or in more extensive masses, a hyperplasia of connective tissue.

Then, again, we see that the tissue in the angle where this new for-

mation lies is devoid of epithelium, except as it is crowded upon from the mucous membrane of either side, such bared surface depending on the thickness of the cicatricial wedge.

The supply of blood-vessels in these parts is diminished, and in many cases entirely wanting, which fact coincides thoroughly with clinical experience; for no operator can have failed to notice how little hemorrhage follows even a deep cut into such tissue. It is only after passing beyond its boundary laterally, or going deeper into the tissues above it, that we are at all troubled with hemorrhage.

The question of nerve-supply is one which cannot be immediately settled, but from observation of the symptomatology we are led to infer that either these parts must be abundantly furnished with nerves, or that the few present must assume a marked exaltation of function.

When we recall how insensitive is the normal cervix, and then contrast this with our every-day observation of the painful character of certain points upon the cervix or of pain transmitted by touching otherwise insensitive parts, we are led to ask, Has there been here a development of nerve-filaments? or have those insensitive ones—namely, those filaments of the sympathetic system accompanying blood-vessels—become transmitters of sensation to the cerebro-spinal system?

We frequently find the cervix painfully sensitive to the touch, which may indicate that we have jarred a sensitive cellulitis or peritonitis. On the other hand, it may be a truly cervical pain or one in some remote part of the body. If local, it is possibly because of cicatricial tissue or other equally hard body imbedded in the softer substance of the cervix, touching and pressing upon filaments of the sympathetic system which communicate with sensitive fibres of the cerebro-spinal system. We must explain in the same manner the distant pain or neuralgia awakened by pressure on these parts without there being any manifestation at the spot touched.

It may seem inconsistent to call to our aid, for an explanation of this circumstance, the filaments accompanying blood-vessels, since we have stated above that the blood-supply in many cases was *nil;* but it will always be recognized that capillaries abound in the immediate neighborhood of such cicatrices, the same as we see about any foreign body; and the more numerous they are, the more active must be the nerve-supply.

Now, whether the cicatrices roll the parts out, whether the weight of the uterus accomplish this by making the anterior lip descend in the axis of the vagina, the posterior being held on the floor of the pelvis, or whether this be produced by the acquired fulness of the lips due to cystic disease and proliferation of connective tissue, need not concern us at this point. Undoubtedly, all these various agencies are at work in the same or in different cases, and as a result we have the mucous

membrane of the uterine canal more and more everted, and presenting in the place of the crown of the cervix, forming an ectropion.[1] Of course, this is the more marked the greater has been the slit or the more numerous have been the fissures in the cervical tissue.

This exposed mucous membrane becomes to some extent infiltrated along with the cervical tissue itself, raising up the epithelial covering and impairing its nutrition.[2] There is a certain amount of engorgement which is due to full vessels outside and to the accompanying prolapsus uteri.

This infiltrated tissue and weakened epithelium, exposed to friction, and bathed also in the discharge which is present in these cases as a sort of exosmosis brought to the relief of the congestion, commonly assumes a change called erosion. This may be limited to the mucous membrane in the canal or to that which is rolled out, but in some cases, notably those which are accompanied by an acrid discharge, a similar condition may show itself even on the otherwise sound mucous membrane of the cervix up to the vaginal attachment.

The erosion is formed by the destruction, in part at least, of the epithelial covering and increase of the underlying papillæ. In some places outside of the canal pavement epithelium may be found to the depth of several layers still protecting the surface; in others, and more positively so when the parts have been exposed to much irritation, cylindrical epithelium is alone found, but this may also be wanting.[3] Beneath this surface we find enlarged loops of capillaries, enlarged glands, and hypertrophied villi—the glands and capillaries alone in the mucous membrane of the cavity of the neck, the hypertrophied villi and capillaries on the surface of the cervix. These villi, increasing to a still greater extent, form fungosities and granulations, in many cases growing to such a size that they become pendulous.

With all this there is an hypertrophy of the submucous layer due to a proliferation of connective tissue; and it is still an unsettled question whether the normal structure of the cervix is not at times entirely converted into connective tissue.

Cystic degeneration, which has been called also glandular erosion, may next engage our attention.

The glands of the endocervical mucous membrane becoming inflamed

[1] "Considérations sur l'Éctropion du Col de l'Utérus et l'Opération d'Emmet," Terrillon et Lermoyez in *Bulletin gén. de Thérap., etc.*, Paris, ci. 106–121.

[2] "Die Erosion und das Ektropium," Fischel, *Centralblatt für Gynäk.*, 1880, p. 425; and "Ueber den Bau und die Pathologische Bedeutung der Erosionen der Portio-vaginalis uteri," Fischel, *Zeitschr. für Heilk.*, Prag, 1881, 261–300.

[3] "Histological Characteristics of Ant. Lip of Cervix, from a Case of Deep Laceration and Early Epithelioma of Post. Lip," Galabin, in *Obstet. Journ. of Great Britain*, 1879 80, p. 638; same, in vol. xxiv. of same journal, p. 53: "Histological Results of Lacerated Cervix, Two Specimens."

and their outlets closed, they distend, and finally burst. Many have a thick wall, and cannot readily empty themselves, so that they continue to enlarge, and frequently attain the size of a pea. The ordinary size is that of a small head of a pin, and of such thousands may be counted. In case the outlet is closed and any ramification of the gland enlarges in an isolated manner, it also forms a cyst. These cysts are found nominally only on a surface which has formed part of the lining mucous membrane of the cervix; practically, however, they occur on the vaginal portion of the cervix, but it may be that their development has been toward the periphery of the cervix rather than toward the canal aspect, which would account for their presence on such a mucous surface; for I think it is well established that there is no glandular structure in the vaginal mucous membrane covering the cervix. The other explanation is found in accepting Ruge's[1] and Veit's view, that new glandular structure is formed by repeated infolding of the normal mucous layer, each new depression being thus naturally lined by cylindrical epithelium, and successive acini being formed from each parent offshoot. These become, in time, choked and over-distended, giving us the numberless cysts visible on the everted mucous membrane, as well as on that which has hitherto not been furnished with glands.

When first these pouches inflame, their contents change gradually from the normal thin, alkaline mucus which lubricates the cervical canal to an acid discharge, ultimately becoming purulent, which carries away with it broken-down epithelium of its own destruction. The contents of the new formation may not be irritating, as were those of the parent gland; the secretion at first has, in fact, more the character of health; being locked up, however, it becomes inspissated, and so, as a rule, we find it thick and gummy. At other times it becomes caseous and even calcareous; then, again, we see it break down, assuming a partially purulent character.

These cysts crowd each other in such profusion that they give a special hardness to the rolled-out mucous membrane, and assist very materially in producing and maintaining the ectropion. Being in such abundance, oftentimes they very naturally diminish the vitality of the parts, not alone by their pressure, which crowds out the proper vascular supply, nor yet alone by their subsequent rupture and cicatrization, which leaves a hardened surface, but also because their presence provokes a constant new formation of cellular tissue, with subsequent atrophy.

Symptomatology.—We may consider the symptomatology of lace-

[1] "Die Erosion und das Ectropium, sowie über die Herkunft des Cylinderepithels an der Vaginalportio bei Erosion," C. Ruge, *Zeitschr. für Geburtsh. und Gynäk.*, Stuttgart, 1880, v. 248–255.

rated cervix at the time of its occurrence, and later when the attention of the patient is drawn to it by a new train of events.

First of all, from the attendant circumstances of the labor the mind of the accoucheur may already be awakened to the possibility, if not the probability, of such an accident having taken place. He has seen the violent efforts of the uterus, the resisting os, the large size of the presenting part, possibly even a faulty presentation; he has felt the lips of the cervix hot, dry, and tumid; he has been well aware that the anterior lip is carried down and is crowded behind the pubes; and when, with these conditions, there comes a rapid delivery after it has been delayed, he need not be astonished to see it followed by a profuse hemorrhage.[1]

This will, of course, not of necessity indicate that there has been a laceration of the cervix: there is still the placenta to come away and the uterus to contract. In fact, even with an extensive lesion the hemorrhage may not be great. The parts have been much compressed and the vessels are not necessarily gaping; they have also been lacerated, and, as often happens in such cases, they do not bleed freely. But should an abundant hemorrhage take place and persist as soon as the delivery of child and placenta is completed and the uterus is contracted, the physician is warranted in assuming that a solution of continuity has taken place in some portion of the genital tract; and clinical experience indicates that injuries to the cervix are the most common lesions of childbed.[2]

From this time until the case has become really a chronic one there may be no symptoms whatever to indicate that any serious lesion has taken place. I say, advisedly, "there may be no symptoms," for, depending upon the extent of the injury, we shall possibly see a sequence of events dating from the delivery, readily recognized by the expert, which, rationally interpreted, will lead us to diagnosticate the lesion under consideration. Such will be a slight or, it may be, a marked degree of feverishness, the somewhat tardy arrival of the milk in the breasts, the same being scanty in amount, and probably an early cessation of lactation, so that the mother is obliged to give up making the attempt to nurse her child. Possibly, she and her physician have by this time become aware that there is some pelvic trouble, but it is rather infrequently that the relation of cause and effect is appreciated by the parties interested.

Later on, it is noticed that the mother, although freed from the tax

[1] See *Amer. Journ. Obstet.*, New York, 1882, xv., Suppl., 48–53, Dr. C. H. Thomas: "Laceration of the Cervix uteri producing Post-partum Hemorrhage."

[2] See *Med. and Surg. Reporter*, Philada., 1882, xlvii. p. 729: "Laceration of the Cervix uteri as a Cause of Post-partum Hemorrhage and of Secondary Hemorrhage during the Month," by S. W. Dickinson, M. D.

of nursing, does not pick up: she is pale and haggard; she begins to complain of a dragging about the hips and loins; and the chances are that she will also complain of a persistent sanguineous discharge or of a leucorrhœa. She is without appetite, her digestion is indifferent, her sleep is disturbed, and the bowels are costive.

It may appear to the reader that I am overstating the case in making these symptoms characteristic signs of laceration of the cervix uteri: to one more familiar with uterine diseases, however, I feel convinced that here will appear, on the contrary, only a true portraiture of an average case of lesion of this character. The truth is, that these symptoms have been and are so universally ascribed to "weakness," their true significance not being sought, that the case is seldom thoroughly made out. These symptoms may persist or may gradually diminish, yet the patient will probably settle down into a condition of ill-health. The symptoms are not always, however, such as are here described.

Although this condition occurs in all walks of life, the most marked symptoms following the slightest lesions are found in the upper ranks, provided the patients have not received such treatment as their condition demands and their means enable them to command. In working-women, on the other hand, great injuries are found existent without the patient's knowledge. These women have not the time or the opportunity to watch themselves closely and to heed every small pain, a dragging here, a weight there, or even to question closely why their health is not what it used to be.

The attendant subinvolution and consequent increase of size and weight of the uterus, possibly also the accompanying over-distension of the vaginal walls and destruction of the perineum, contribute in some measure to the production of these ailments; still, the association of these additional features with laceration is so frequent, if not general, that we are even justified in looking upon the injury to the cervix as, in the main, the cause of the whole, or in other instances as the first product of a common cause.

The disease is now becoming well established, though not by any means chronic, since the injury for a considerable time still remains in *statu quo*, and the subjective symptoms are not by any means as marked as they will become later on. A few months more, however, will transfer it to the chronic infirmities.

We notice, in the first place, that the woman fails to regain the health she has lost: it is not a mere temporary failure of restoration—she has become a permanent invalid; all her color has gone, and the persistent use of tonics fails to bring it back. The dragging about the hips and loins is there still, so also is the uterine discharge. There is dyspareunia, coitus is commonly followed by a show of blood, besides

which there is very frequently a total loss of sexual desire.[1] In addition to these symptoms we have disturbances of menstruation. In some individuals the flow is markedly less, even to the point of cessation. This occurs in women who have by no means reached the normal climacteric, but in whom either the complicating peritonitis has invaded the ovaries and rendered them useless, or has occluded the Fallopian tubes, or in others with whom there is a condition of superinvolution rather than subinvolution, the menopause being virtually established at an early age.

With most women, however, the menstrual disorder is the other way, there being menorrhagia and metrorrhagia, both due to complicating inflammations promoting uterine and tubal congestion; then, again, the habitual accompanying fungous condition of the uterine mucous membrane is a constant source of similar trouble.[2]

There is another symptom which has more significance; that is, the oft-repeated miscarriage, without, so far as the patient knows, any appreciable cause. This occurrence is readily understood from the condition of parts as seen in the section on Complications. In other women sterility will be persistent, dependent on the presence of a thick cervical discharge.

The most marked and characteristic set of symptoms, however, lies in the nervous system. That previously mentioned—namely, the change in the character of the blood—is one of the more prominent. The more or less constant pain in the back of the neck and at the base of the brain belongs to the same class of symptoms. The failure of memory either as to names or facts, and a feeling of dragging at the back of the eyes, are also common, and the variable or irritable disposition is one of many symptoms which we are almost sure to find present in a chronic case.

Many other effects on the nervous system, elsewhere enumerated as complications, are not mentioned again here, inasmuch as they are in no wise specially pathognomonic.

Complications.—Though it might be supposed, if all proper means of cleanliness be taken during and after labor, that no inflammatory complications can arise, yet we meet with them even in spite of the best efforts at prophylaxis. Many physicians do not understand the wisdom of the *aseptic* treatment, and they will not employ any such means until the *antiseptic* is imperatively called for, and then it may be too late.

One of the early possible occurrences after a laceration of the cervix

[1] "An Analysis of Forty-four Cases of Laceration of the Cervix uteri," by Dr. E. I. Ill, in *Trans. Med. Soc. New Jersey*, 1882, 157–161.

[2] "On Lacerations of the Cervix uteri, their Consequences and Treatment," by T. M. Madden, M. D., *Dublin Journ. Med. Sci.*, 1882.

has taken place is a certain amount of inflammation in the neighboring cellular tissue or in the pelvic peritoneum, in the veins of the pelvis or in the lymphatics.

These inflammations which take place after childbearing are now usually recognized as septicæmic, but still the idea is not sufficiently widespread that they commonly originate in a solution of continuity of the cervix or of adjacent parts.[1]

It is the generally received notion that the lochia have undergone a putrefactive change, and have in part been absorbed by the lymphatics, or that there has been a primary inflammation of the plexuses of veins, a phlebitis which has extended to the cellular tissue surrounding other plexuses; or, again, that a part of the internal surface of the uterus has sloughed, or that a retained clot has broken down, and so has given rise to the inflammatory or septicæmic symptoms.[2] This may all be true, and undoubtedly often is the case. It is generally a surmise, however, since there is nothing in these symptoms to establish whence the trouble comes; and there can be no question, judging from the frequency of this lesion accompanying a history of such inflammatory complications after confinement, that many and many a case has the wrong cause assigned to it; in other words, that many cases of laceration of the cervix pass unnoticed even though clearly indicated by these very signs of pelvic trouble.

When such an inflammation is in process of development we have evidence of the mischief in some slight pain in the hypogastric region, right or left—more usually the left, because of the greater frequency of injury on that side and an elevation of temperature of one, two, or three degrees, depending on the virulence of the poison and the amount absorbed.

If we now make a digital examination, we may learn positively how this new element has entered into the case. One need not dread being a source of infection: the symptoms point clearly to such an agency being already at work, and our business is to learn whence it arises and how to get rid of it.

Even when aseptic injections have reached the cavity of the womb they frequently fail to reach the source of infection. The finger in the vagina will give us unerring guidance to the cause of trouble by apprising us of the condition of the parts immediately involved in labor, as

[1] "How numerous are the cases of puerperal fever treated to-day with but a feeble appreciation of the true origin of the disease!" . . . . "In how many such cases are the passages explored with a view to the direct application of remedies to the torn cervix, so often the sole origin of the disease!"—W. M. Polk, M. D., in article "Can Lacerations of the Cervix uteri be Prevented?" *Trans. Am. Gyn. Soc.*, Philada., 1881, p. 407.

[2] See *Amer. Journ. Obstet.*, 1882, p. 49: "On Antiseptic Midwifery and Septicæmia in Midwifery," by Robert Barnes, M. D., F. R. C. P.

well as of those less directly concerned, but nevertheless suffering from putrid absorption. In this way we may recognize a sloughing surface or mass, possibly involving a large portion of one lip of the cervix. This knowledge will enable us to treat more directly than heretofore, or even to effect a radical cure by removing the mass. Although exceedingly foul clots are sometimes expelled from the uterus days after labor, which have not given rise to any appreciable disturbance, yet we are not thereby justified in allowing such a clot to remain when we are sure of its presence.

In some cases all sinuses will be closed, and absorption therefore slow; in others trouble will arise from activity of the capillary circulation and abundance of lymphatics. The finger may detect small chains of hardened bodies running from the cervix to lateral portions of the pelvis or in an anterior or posterior direction. These lymphatic vessels, filled already to excess and themselves inflamed, carry both poison and products of inflammation to the larger reservoirs, the lymphatic glands. Here we find more induration and general thickening, in patches, in nodules, or even diffused throughout the surrounding cellular tissue.

When inflammation has once invaded this region, it travels rapidly and causes marked and widespread induration. The uterus is consequently crowded in the pelvis to the side opposite to that in which the cellulitis exists. In case of a severe inflammation involving both sides the uterus will be generally carried down in the median line. Such symptoms, however, do not belong to the early stages of mild cellulitis; before they occur we receive warning from well-marked constitutional disturbances. These symptoms may vary in degree and in the position of their occurrence. If we find less fulness associated with greater hardness in a higher plane, and much more tenderness on pressure, we are justified in diagnosing an involvement of the peritoneum, either alone or with the cellular tissue. The lymphatics reaching the peritoneum, rather than those terminating in the cellular tissue, are here chargeable with the conveyance of the poison. There will have been high temperature—103° and 104°—full tense pulse, dry hot skin, dry tongue, more pain in abdomen on one side or both, tendency to urinate more frequently, and, probably, cessation of the lochia.

From this point on the inflammation may follow any one of the different courses open to it. It may subside, cease at the point of lymph-exudation, undergo resolution, or be carried to the point of suppuration.

To deal with all these possibilities would be but to repeat the whole clinical history of adeno-lymphangitis, pelvic cellulitis, and pelvic peritonitis, which have been treated of elsewhere in this work. It will suffice to take up the one condition which has more especially to do with our subject as a complication, when the case has passed this lying-in period; otherwise, we should still have to consider abscess of the

ovary as well, even phlegmasia alba dolens, since it also may be a complication if not a consequence.

Fixation of the uterus, to which I refer, is scarcely a distinct affection, since it may result from any of these inflammations. It complicates a large number of cases manifesting even a moderate laceration of the cervix. It is produced sometimes by a cord running off into the cellular tissue: this may be in part the trace of a laceration through the vaginal wall which has left a cicatrix. This is a particularly troublesome result of laceration through the posterior lip, as it results in incurable retroversion. Again, the cause of fixation may be found in a chain of lymphatics choked and permanently indurated, or in an induration of the cellular tissue itself. Such a hardening may extend up one side of the uterus beyond our reach, and may be regarded as a thickening and adhesion of the opposed surfaces of the peritoneum forming the broad ligament. When posterior to the womb it may indicate thickening of the utero-sacral ligaments.

Whatever may be its nature, this affection generally yields to appropriate treatment long continued; yet we sometimes find it a most persistent complication which forbids our interference by its painful character, though we may occasionally be forced to disregard its persistency, and even to operate.

Another complication more directly referable to the subject under consideration is menstruation irregular both as to time and quantity, the menses being disposed to recur too often and to last too long.

As these two conditions—namely, metrorrhagia and menorrhagia—are but symptoms after all, we may at once go to the cause and consider the bearing of the laceration of the cervix upon them.

We know that the uterus has never resumed its original proportions; that in consequence the flow of blood has constantly been too great toward it; that an excessive quantity has been retained by it; and we can readily see how an excessive growth should be induced thereby. Likewise, areolar hyperplasia, assuredly a result of excessive nutrition, leads to the formation of granulations and mucous polypi from an abnormal development of the glandular tissue of the canal.

These are the growths which give rise to the excessive monthly flow, and they assume very great importance as complicating the lesion we have before us. They give rise to it, indeed, and yet are not solely responsible for it; the uterus itself plays a considerable part in its production.

From the very first after the injury has taken place, if the organ does not undergo the involution which is natural, the character of tissue remains more or less unchanged, the sinuses large, and the organ turgid; it cannot contract upon itself or upon its vessels, nor are its vessels indeed in a condition to contract spontaneously; consequently, when,

at the menstrual epoch, the broken-down cells are thrown off from the endometrium, the inert tissue, with fatty vessels back of it, still continues to bleed; and this is still more marked when villi have developed on the surface, forming the fungosities. Increased vascular supply and increased bleeding surface are the result.

This enlarged uterus in the condition of subinvolution is one of the most formidable complications we have to deal with. From its weight it falls laterally, anteriorly or posteriorly, settling down so far as to become a pathological displacement, sometimes even protruding from the vulva. The lower it sinks, the greater the tension on its vessels, and the greater the consequent diminution in their calibre and in the blood-supply they convey. The woman may experience but little discomfort, since the parts may have become accustomed to the strain. Replacement of the uterus obviously allows these overstretched vessels to gather upon themselves, to fill, and to allow the parenchyma of the organ to do likewise, and we actually cause more distress than before. Those who lack experience in the management of these cases have occasionally secured the previous degree of comfort by pushing the uterus very high, and thus repeating the pathological stretching and narrowing of the vessels.

This argument may seem opposed to certain facts well known to gynecologists in regard to this very elevation or depression of the uterus, which have always to be borne in mind when sustaining or supporting it—namely, that the depression below a certain line or the elevation above a certain plane will cause discomfort rather than a feeling of ease. It is only a matter of degree, for if the variation from the health line be slight in either direction, discomfort will result. The veins, being more yielding than the arteries, first diminish, and by impeding the return of an undiminished supply of blood cause passive congestion and pain. The drag of the uterus upon the other organs of the pelvis, the ovaries and tubes, the bladder and rectum, and its interference with their functions, are additional sources of disturbance, entailing fresh complications—namely, excessive pelvic pain, irritable bladder, and hemorrhoids.

Induced sterility is a very serious complication of lacerated cervix, often overlooked on account of insufficient familiarity with the subject. It is only too common for the practitioner to try to cure endometritis, endocervicitis, uterine catarrh, and similar troubles without attempting to find their cause. Indirectly, it is true, but by an unmistakable sequence, a discharge is established in the uterine canal, and during its persistence impregnation cannot occur. Elsewhere in this paper we have seen the mechanism and nature of the morbid process, and in the section on Treatment the method of overcoming the difficulty is detailed.

Still another important complication to consider is that of inability

to carry, the liability of the woman to abort.[1] This tendency is not present in every case, of course, nor can it be definitely stated to what exact degree the laceration need extend to render the cervix incapable of furnishing the proper support to a developing ovum. We meet with so many cases of constantly recurring miscarriages in women in whom nothing else is at fault that, discovering this lesion, it seems but fair to attribute the one to the other; and this reasoning cannot be gainsaid in cases in which, after repeated mishaps—usually toward the third month—this inference has led to an operation for repair of the cervix, followed by a delivery at term.[2]

Many cases which come under our notice are palpably unfit to furnish the necessary support, notably those in which the tear has extended well up into the broad ligament on one side or both, and has not healed to any great extent. There are others, again, in which, on the external surface of the cervix, there is perhaps no trace of a laceration, and yet miscarriages will constantly occur. Such instances would seem difficult of explanation, and to many our interpretation might seem entirely incorrect, were it not that we can still demonstrate that a marked and deep laceration exists *within* the cervix. Such a tear may be circular or circumferentially linear, or it may be longitudinal and concealed, nothing visible indicating an entire division of the inner os or of the whole length of the cervix down to the external os, which is either intact or merely closed at the mucous membrane. Occasionally these cases become pregnant, and require such management as the circumstances may indicate.

There are still other complications in the way of various neuralgias, apart from the ordinary pain due to the presence of cicatricial tissue in the angle of the wound or over the surfaces of the rent, which has failed to heal.[3] Nor does the nervous element exhibit itself in the way of neuralgia alone, but in every kind of neurosis as well, disturbance of innervation leading to the most varied reflex forms of disease. Every general practitioner will recall cases exhibiting various and changing ailments which he could neither explain, relieve, nor cure. Among these symptoms we may mention a neuralgia about the head or face, persistent, not dependent on cold, local injury, imperfect teeth, inflamed ear, or constitutional diathesis; a painful eye or affected sight, not due to any appreciable local lesion or loss of power; a toothache,

[1] See *Chicago Med. Gazette*, 1880, i. p. 46, S. V. Clevenger, M. D.: "Lacerated Cervix uteri a Probable Cause of Recurring Abortion."

[2] See *Med. News*, Philada., 1883, xlii. p. 225, case reported by Dr. B. F. Baer, in his "Analysis of Twenty-seven Operations for Restoration of the Lacerated Cervix," of repeated abortions evidently due to this lesion. Op., subsequent pregnancy, carrying to term.

[3] See *Med. Record*, New York, 1879, xvi. p. 529, Dr. T. Gaillard Thomas: "Pelvic Neuralgia due to Laceration of the Cervix."

most constant, without special exacerbations and also with perfectly sound teeth.

The many and almost daily instances of impaired mental powers, of the change of disposition from gay to sad, of acquired irritable temperament, of loss of enthusiasm for occupations or pursuits which were formerly engrossing, broken rest and bad dreams, are only samples of the many disturbances which at times we find are referable to this lesion. Yet we do well, also, to keep in mind Dr. W. Goodell's remark in the *American Journal of Obstetrics*, Jan., 1882 ("Notes of One Hundred and Thirteen Cases of Operation for Laceration of the Cervix"), "that nervous exhaustion and spinal irritation will evoke symptoms which others, as well as myself, have referred to slight cervical tears, but which are in no wise dependent on these lesions."[2]

Vesico-vaginal and Vesico-cervical Fistulæ.—Although the antero-posterior lacerations of the cervix are said to be the most frequent, yet they are not the most common forms met with, for the reason that they heal very readily and leave but a linear trace to identify them. The supply of lymphatics is not as great in this position as in the lateral portions of the cervix; therefore, even though septic material may be in the neighborhood after the occurrence of such a lesion, it cannot be so readily taken up to interfere with primary union of these parts.

It occasionally happens, however, that the cervix is very extensively lacerated in the median line, even through its entire length and thickness, the rent extending into the base of the bladder. This injury may also heal, and commonly does to a great extent; but sometimes the constant passage of water over the edges of the wound, and especially the deposit thereon of phosphates from the urine, will prevent perfect union; in which case we discover the laceration complicated by a vesico-vaginal fistula, or, in another case, the lips of the cervix will close up

[1] See P. F. Mundé, in *Am. Journ. Obstet.*, New York, 1882, xv. 909–911: "Hemicrania and Sciatica depending on Laceration of the Cervix and Chronic Pelvic Cellulitis; cure by Local Galvanization and Operation."

The same: "Reflex Syncope produced by Pressure on the Cicatricial Plug of a Lacerated Cervix; cure by Trachelorrhaphy," *ibid.*, 1882, xv. 907–909.

Dr. H. W. Longyear, *ibid.*, 1883, xvi. 25, 28: "Persistent Salivation apparently due to Laceration of the Cervix uteri; operation, cure."

Dr. R. S. Sutton, in *Transactions of the American Gynecological Soc*, 1880: "Case of Cataleptic Convulsions cured by Trachelorrhaphy."

Dr. T. A. Emmet, in *Principles and Practice of Gynecology*, 1884, p. 488 *et seq.*: "Facial and Intestinal Neuralgias."

"Cases of Laceration of the Cervix uteri, with Unique Symptoms" (some reflex and others due to attendant inflammation), by C. M. Wilson, M. D., in *New York Med. Journ.*, 1886, xliii. 220.

"Epilepsy dependent on Erosions of the Cervix," Engelmann, *St. Louis Clin. Rec.*, p. 28. He refers also to his own article on the hystero-neuroses in *Trans. of the Amer. Gynec. Soc.*, vol. ii. 1887; also to similar cases reported by Dr. I. M. McWhorter in *Trans. of the Med. Soc. of West Virginia*, 1877, p. 308.

to the deep angle, leaving, however, a sinus which connects with the bladder, forming there a vesico-cervical fistula.

Every variety as to shape of such cervices may be met with, particularly as such extensive injuries arise from sloughing, in which case the resulting cicatricial tissue distorts the parts, so that frequently what we may take to be a lateral laceration of the cervix with a vesico-vaginal fistula is, in fact, an anterior laceration through the base of the bladder, and *vice versâ*.

Dr. T. A. Emmet in his work on vesico-vaginal fistula[1] gives numerous instances of this variety of laceration of the cervix; and the reader will profit more by studying such cases in their original record than by means of a synopsis. It is here sufficient to say that these lacerations are to be dealt with in precisely the manner detailed for the operation in general, especial care being taken to denude to the extreme depth of the angle and to bear in mind the requirements of the fistula.

In the case of a partially-healed laceration leaving a passage for urine, it becomes necessary to slit through the cervix; in other words, to re-establish the lesion, so that we may thus denude the fistulous opening thoroughly and secure union from the bottom.

A last complication to mention is epithelioma fastened upon a lacerated cervix. If early, the laceration can generally be detected by the great fulness and rolling out of the cervical mucous membrane, the new disease showing itself in this situation first.

Even during active sexual life there is a tendency to this pathological change, which is in a great measure favored by the abundant blood-supply accompanying the conditions attendant on this lesion; and it is still more to be feared at a time when there is a retrograde change in cell-growth—namely, at the menopause if the constitution be at all impaired by previous illness. This same condition of ill-nutrition may prevail before the senile change comes on; especially is this the case as regards cicatrices, and it is often upon these that we first see the establishment of malignant disease.

Diagnosis.—There are three means of making a diagnosis of laceration of the cervix: we may arrive at it inferentially from the history furnished by the patient, or by the touch, or, again, by ocular inspection.

The first mentioned will scarcely prove serviceable to those only moderately familiar with women's ailments. The older practitioner or one devoting himself more specially to gynecology, however, cannot fail to have so vivid an impression of the association of subjective symptoms that unmistakably he will make a fairly correct analysis of the case without having to prosecute his search for evidence farther.

[1] *Vesico-vaginal Fistula from Parturition and Other Causes*, T. A. Emmet, M. D., New York, 1868.

The physician should not, however, content himself with this method. It frequently happens that a most extensive injury presents no symptoms, the woman herself remaining in fortunate ignorance of the lesion, and therefore failing to call attention to a matter which will most assuredly demand remedial measures sooner or later. Then, again, though the physician should infer the existence of such a condition from the symptoms, it is imperative that he should not stop there, for the question as to the most appropriate local treatment at once arises. A digital examination is therefore demanded when there is reason to suspect such a condition.

It is occasionally possible, immediately after labor, to determine by the touch that a laceration has taken place; such will be the case, more especially, when the cervix has been enormously congested and pinched, so that the lips show a great thickness even after the compression has been removed, or it may be that a flap is pendent. Here the rent would appear larger than it really is because of this thickening. Should the laceration, however, be stellate or internal, no evidence of it can be obtained in this way, unless, indeed, the clefts be markedly deep. As a rule, the cervix after labor offers to the touch such a decidedly mushy feel—is, in fact, so spongy and soft—that one is mostly content to leave it to Nature to be restored before feeling confident of any positive fissures or tears.

This being stated, it seems unnecessary to dwell upon the question of ocular inspection, for it will be evident to all that in such cases the speculum will tell us nothing that the experienced finger has failed to establish,[1] nor will it be necessary to make use of this method of diagnosis at such a time, unless, in a very exceptional case, we may be called upon to pass a suture to control an otherwise uncontrollable hemorrhage.[2]

If this same case runs on for four or six months longer without healing, these same methods of exploration will reveal to us something very much more positive. The finger within the vagina will then almost surely find the uterus rather low in the pelvis. The cervix will feel decidedly larger than it should be following a strictly normal labor, but the consistency will be much softer. The touch will appreciate also a velvety condition of the more prominent parts of

[1] Prof. Karl Schroeder in his *Lehrbuch der Geburtshülfe, etc.*, Bonn, 1884, p. 693, recommends drawing and crowding the uterus down to the vulva for inspection, and, if necessary, for operation directly after labor. I cannot think this advisable: such displacement of the uterus, with a possibility of rupturing vessels, is undesirable, and the use of even Muzeux's forceps is sure to wound and lacerate the congested lips of the cervix still further. It is far better to place the patient on the side, and by the aid of Sims' speculum to do whatever is necessary—pass a single suture or close the entire wound.

[2] Dr. Montrose A. Pallen was the first to stitch a torn cervix immediately after labor to arrest hemorrhage. His account of two successful cases is published in the *Richmond and Louisville Journal* for 1874.

the cervix, and possibly the main portion of these velvety patches will be a trifle raised, so that the finger can distinguish rather accurately the defining border. This condition indicates the constantly accompanying erosion.

In feeling for the os uteri we shall recognize that it is no longer slightly elliptical, but that it is either very much elongated, broken up in sections (stellate), or that it is not at the crown of the cervix, but has completely disappeared. In the first case the laceration will be a comparatively slight one, possibly confined to the lower portion of the canal, either unilateral, bilateral, or involving the anterior or posterior lip. This, however, is not absolutely certain, and we must not allow ourselves to pronounce positively on this point without pushing the investigation farther (Plates I. and II.).[1]

There are cases in which the os externum appears even perfect, in which, with care, we may detect a most extensive laceration within the canal, either longitudinal or transverse, possibly even circular. These are the cases which are most commonly overlooked. If we happen to see the woman a couple of months after confinement, what may have been a rupture of the external os has already united and presents a normal appearance, while the inner tear, for various reasons, has not had the opportunity to heal, and, if not treated, will always remain a concealed pouch. Now, in such an instance, where a lesion of this kind seems probable, we shall be enabled to make out the exact state of affairs by the use of the uterine sound, which will, after entering a possible "pinhole os," find itself in a comparatively open space; and, furthermore, in drawing it down from within that portion of the uterine canal which is known to be sound, a very perceptible jog or shoulder will be felt on either side at the upper portion of the rent.

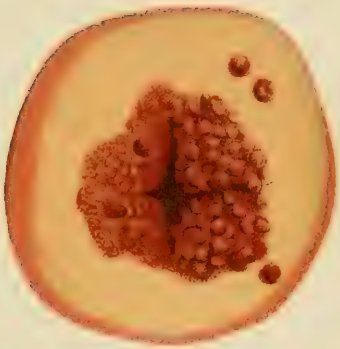
In another phase of this rectilinear tear, the os being markedly open from side to side, we may be able to pass the finger-tip up into the cervix, no part of the original injury having healed since its occurrence. The stellate laceration will be made evident to the touch by the recognition of numerous nodules, the interspaces of the various rents.

In these cases there is rarely more to be found than is indicated by our first touch: appreciating a given amount of injury in various places at the crown of the cervix, we realize that fissures thus traced must travel up just about so far in the length of the cervix before finding their limit; and so we may always feel very certain that the injury within is no less than it appears on the surface.

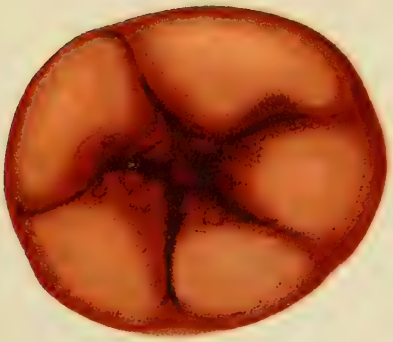
The third form—that in which the whole os has disappeared—

[1] Plates from Dr. P. F. Mundé's article in *Am. Journ. Obstet.*, New York, 1879, xii. 117-134, entitled "The Indications for Hystero-trachelorraphy, or the Operation for Laceration of the Cervix uteri," with my own interpretation of conditions represented.

Granular erosion of cervix.

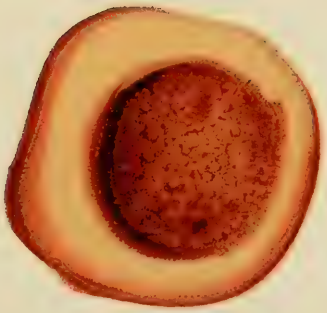


Cystic degeneration
after laceration.

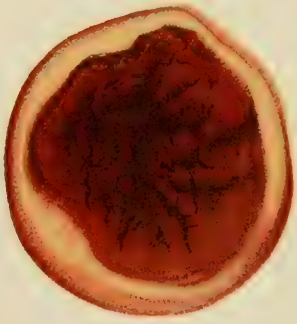


Deep stellate laceration.

Stellate laceration with
ectropium and cystic disease.



Crescentic laceration
with erosion of one lip.



Deep destructive laceration
up to inner os.

Laceration of Cervix.

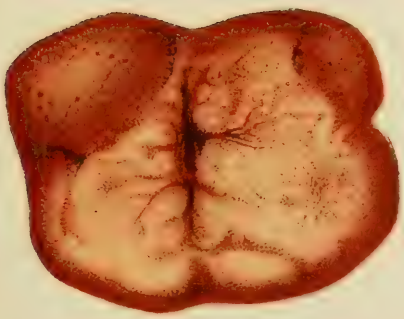
T. SINCLAIR & SON, LITH. PHILA.

Unilateral laceration
beyond vaginal insertion.

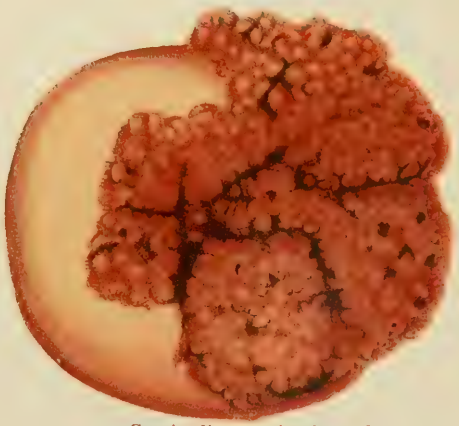
Stellate fissure
with erosion.

Double laceration
with erosion.

Double laceration
beyond vaginal junction.



Bilateral laceration
great erosion and
cicatricial induration.



Cystic disease implanted
on lacerated cervix, simulating
cauliflower growth.

Laceration of Cervix.

SINCLAIR & SON, 11TH PHILA.

bespeaks a frightful amount of injury, not only of laceration, but of sloughing as well, unless it be one of those rare cases of transverse laceration in which a complete ring of cervix has been torn from the body of the uterus. Or, again, the tear may not have been confined to the cervix, but may have extended in one or more directions into the vaginal walls, leaving a huge cleft.

Continuing the digital examination, we shall be able to determine whether the os, or the opening resulting from the tear which represents the os, is in the median line or at one side. Unless the laceration has been bilateral, and equally deep on both sides, the os will probably be found displaced. Of course, it is impossible, without other methods of examination, to find out how much this deviation may be due to the amount or location of the injury, and how much to a corresponding deviation of the uterus. This we accomplish by bimanual palpation or by the aid of the sound introduced into the uterus. If by these methods we find the body of the uterus lying toward the same side as that on which the os appears to be, we may positively make a diagnosis of cervical injury of that side. Should the uterus tip to the side opposed to that toward which the os points, we shall hesitate and argue rather that the uterus or its appendages are at fault, for, in truth, though it may happen that the uterus be so misplaced in relation to a lacerated cervix, yet it must be from an infrequent combination of circumstances, such as a development of acute peritonitis following the injury, and more marked on the opposite side, so that it binds the uterus in that direction; or, again, from the presence of a fibroid on the side opposed to the injury, which also would throw the fundus over.

These two points are important ones to bear in mind, and of course have to be considered in making the diagnosis clear, as it is evident that the same conditions may be present on the same side as the deviating os, and yet must stand for nothing as bearing on our diagnosis of laceration of that side.

Should there be an enlarged cervix, we seek to establish its bearing on the question of diagnosis, and though at an early stage this feature is not as marked as it will become later, yet, while in process of formation, a skilled finger will detect it and give it its true significance.

In passing the finger around the cervix at the level of the os internum—that is, by pushing up the vagina against the uterine body—one can appreciate that the supravaginal portion of the neck is considerably smaller than the infravaginal. The latter is swollen, and, compared with that above, has a mushroom-like feel. The edges of this "mushroom" may sometimes be caught from above by the finger-tip and rolled forward toward the os uteri; at other times they are too firm and resisting, and one may only feel them *in situ*.

When once rolled over and brought down like flaps, even the touch

can appreciate at once that this enlargement is not real. These edges, turned down from all sides, will now not make the volume that was apparent before. In fact, by restoring them to their natural position, we have but their own thickness, while it was double when they were turned back on themselves.

This increase of size, we have seen also, is attributable to the attendant engorgement due to the sagging of the uterus, this, again, being dependent on the size and weight of the organ.

There is also the frequently accompanying pelvic inflammation, which acts like a constricting ring about the cervix at the vaginal junction, thus making the inner soft parts roll out in the same way as in simple cases of pelvic inflammation without cervical lesion. In addition, we have a certain amount of cystic disease already formed, which contributes to the enlargement.

There is still something that the finger may detect even thus early after the injury has been received, and that is the sharp edge at the termination of the wound or at the point at which healing has ceased. Carrying the finger on beyond this point, we may often trace the course of the injury even on to the vaginal walls and in the thickness of the broad ligament. These cicatricial lines and others resulting from sloughing will put our mind on the alert when, otherwise, the case might not seem so clear.

Now, if at this stage we seek for an elucidation of the case by the aid of the eye, we may note some features which are at once characteristic and diagnostic.

We must be careful not to overlook the very lines we have been considering, as we might readily do on account of their exceeding faintness. If due to multiple tears in the tissues, they will appear like little scattered mother-of-pearl threads; if due to a single laceration and line of repair, only a single line will appear. Furthermore, we shall see the enlarged and engorged cervix, dark colored if the sagging and congestion have been great or if the examination is made shortly after labor. We shall see the os just as we have felt it, either natural in case of a concealed laceration, slightly or much enlarged, or stellate or obliterated; perhaps displaced toward one side or the other of the vagina, and the inner part of the cervix probably beginning to roll out somewhat, because of the solution of continuity. This inner portion will present a reddened surface much akin to the normal interior of the cervix, except that, being pinched somewhat, it is also congested, and the full capillaries can be traced over the surface. In many cases, when the injury has been extensive, the arbor vitæ shows plainly, the rugæ being more marked than in their normal condition, also because of the above-mentioned engorgement.

Within the os will be seen more or less of a discharge, thicker and

more tenacious the farther the case has progressed. This is habitually so firm and adherent that it can only be removed with the greatest difficulty, and often at the expense of the underlying surfaces, as they have to be rather harshly rubbed before they will yield up this mucus from the open mouths of their glands. After removing this discharge —or, possibly, even without disturbing it—we may come upon a rose-colored patch of varying size extending from within the patulous os tincæ on to the crown or outer edge of the cervix. This is the surface which we recognized by the finger as velvety and considerably softer than the surrounding part. Its coloring is brighter at its central portion than at its outer border. The middle portion is also dotted with small elevations, quite discernible by the naked eye because they catch the light and show as brilliant spots. These are the enlarged villi in the midst of the erosion. The enlarged capillaries running through it may also be recognized.

After inspecting it for a few moments one may notice that it loses its bright-red color and becomes much more pink. This effect is temporary only, yet it goes far to prove that there is no destruction of tissue, and that we are not dealing with anything like an inflammatory ulcer. In fact, the exposure to the air accomplishes not only this, but its astringent effect is also to reduce the fulness of the erosion, so that it quickly assumes the same level as the neighboring parts.

Now, to complete the diagnosis it only remains to seize the cervix with tenacula and to seek to form the normal os. The case being recent, the lips are not yet much thickened and hardened, and there has not yet been any great development of cystic disease, so that this manipulation will prove most simple and easy. The relation of the parts will at once be established, and it will be evident beyond a doubt that there has been a solution of continuity.

If there has been sloughing of the parts and loss of substance, the case will assume a different aspect from what it would in a simple laceration. The same is true if the cicatricial bands are many and are beginning to contract and draw the parts out of shape. In such cases we find the cervix, or what remains of it, flush with the vaginal roof, partially buried under a vaginal fold, bound down to one part or another of the vagina, according to the formation of cicatricial bands, or even twisted on its own axis, so that what is really a transverse laceration appears to be antero-posterior, and *vice versâ*.

There remains but little to be said of the chronic form, in which the laceration is old and well established, except that the diagnostic signs grow more marked with the passage of time. Physical exploration at this advanced stage will reveal characters not yet fully developed in the earlier type. We now find, on introducing the finger, that the cervix is very large; it is flattened out and the mushroom effect is still more

positive; the finger can, in most cases of extensive laceration, be absolutely hooked over the edge. If we call bimanual palpation to our aid, we recognize that it is not alone the cervix which is large, but that the entire organ is much beyond its normal size. The body will be found large, flattened antero-posteriorly, and, if there has been no inflammatory complication, wabbling about or retroverted. Commonly, it can be shifted readily from one position to another, the ligaments being so lax that they have little or no hold upon it.

On feeling for the os we may recognize nothing but a great slit directed probably against the vaginal wall, to one side or the other.

If the injury has been marked, we find a hardened line running out from the present limit of the breach into the thickness of the base of the broad ligament, and, possibly, the cervix will be tightly bound over to that side. This also has the effect of dragging the uterus down in the pelvis, independently of its size.

The finger may be easily passed into the uterine canal, and sometimes it is so gaping as to admit fully the first phalanx. The inner face of the cervix will be felt soft and velvety, and it bleeds on slight provocation. This same condition will, in some cases, be found to reach the vaginal portion, depending much on the amount of acrid discharge and on the amount of prolapsus.

The condition of granulation and erosion is therefore much more marked than in the earlier stages.

Other cases, again, will give a hard, bossed, uneven surface, firm, resisting, yet elastic. This will readily be recognized as composed of multiple elevations, being made up of the distended follicles of the cervical mucous membrane; in other words, it presents the condition of cystic disease commonly accompanying and forming a part of these cases of laceration. The older the case, the more numerous will these cysts be, though not, of necessity, the larger. Those appearing early are rather the greater in size; as the case proceeds, the larger ones rupturing, a considerable number of small ones develop and crowd the mucous membrane, making it feel like a nutmeg-grater.

If at this period of formation we insert the speculum and inspect the parts, we find conditions very similar to those detailed above, yet intensified. For instance, the lips will appear more thoroughly rolled out and the everted mucous membrane puffed. The tissues are much more firm and less friable; if handled with a tenaculum, except for the granulations and erosion, they do not bleed as profusely as they would in a less chronic case; and, by the same means, we find that the lips, if the parts have been the seat of cystic disease, cannot be as readily rolled in as formerly; it is no longer as easy to shape the cervix so as to present anything of a normal os.

Other cases, again, reaching this stage, will appear much less import-

ant than less chronic ones, because of the more advanced disease and subsequent atrophy of the cervix, which for this reason seems much more shapely.

Differential Diagnosis.—As the exact diagnosis of this condition is not always an easy matter, so also are there some difficulties presented in differentiating it from other pathological states.

The most common lesion with which it may be confounded is eversion and erosion, due simply to a chronic pelvic inflammation.

Just as we see this condition brought about when a solution of continuity does exist, engendered to a great extent by the attendant or subsequent pelvic engorgement and inflammation, so it is produced without any laceration. In many cases it is exceedingly difficult to determine which condition exists; and the physician is inclined to suspect a patient of attempting to conceal a past conception. On the other hand, he may be surprised at his own faulty judgment when he sees the cervix resume its natural appearance on appropriate treatment, all signs of laceration disappearing as the uterus is allowed to rise in the pelvis, thereby being relieved of engorgement. An important point in differential diagnosis is the absence of any trace of a cicatrix, though, it is true, a woman who has borne a child may present the appearance of a cicatrix, in which case the rolling out is perfectly parallel and glandular; hypertrophy is not so common, yet the cervical catarrh is most marked. The absence of a cicatrix therefore remains as a valuable piece of negative evidence.

A second condition with which laceration may be confounded is malignant disease of the cervix, since the habitual development of the gland-structure imparts to it at one time a hard, nodulated surface, at another, particularly if the villous hypertrophy be marked, a soft, velvety feel, which inspection shows as a red congested mass, sometimes of enormous size, bleeding readily on pressure, and often breaking down. Such is the condition which Dr. Robert Ellis, obstetric surgeon to Chelsea Hospital and Belgrave Dispensary, in *London Lancet*, 1861, vol. ii. p. 83, describes as "the fungous ulcer." He says that in some hundreds of women he could not recall a single case of its occurrence in one who had not been pregnant. He describes it thus:[1] "Cervix soft, large, spongy to the touch; os wide open, so as to admit the finger; ulcer large, pale, studded with large and friable granulations; discharge, a glairy, brownish mucus, frequently deeply tinged with blood."

The temptation to destroy this surface, even if epitheliomatous, may lead to the discovery of the true condition, since the separated lips may be approached and the cervix give promise of full restoration to its normal shape. Such could not be the case were there a develop-

[1] *Lancet*, 1862, vol. i.

ment of malignant disease without solution of continuity. To determine the matter apart from the test just mentioned, we must consider the condition of the general health, for with malignant disease advanced to the point which such a mass would imply some cachexia would probably have already been established.

We must not lose sight of the fact, either, that this condition of excessive villous growth, though benign at the first, may assume unhealthy action and become malignant. Sometimes the border-line is very indistinct.

Finally, the microscope comes into play to determine whether the condition be one of excessive proliferation merely, or whether the cell-type has changed.

In the *Lancet* (London) for 1873, vol. ii. p. 811, we find the following: "At a meeting of the Royal Medical and Chirurgical Society, held Nov., 1872, Dr. Arnott said that during the last two or three years he had had two or three opportunities of examining snippings of 'cauliflower' growths from the os uteri, given him by Dr. Barnes. He had found them nothing but ordinary villous outgrowths, branched, club-shaped villi, covered by columnar epithelium."

"In the malignant growth with villous processes there is the course of cancer, but in the simple villous growth the general signs of malignancy are produced by the drain on the system through the constant discharge and loss of blood."[1]

Prognosis.—In treating of this division of our subject it would manifestly be a grave error to draw too dark a picture of the evils resulting from a laceration of the cervix, just as it is a manifest error on the part of many general practitioners to disregard the question of evils to come and to treat lightly any existing lesion, confident that the case will take care of itself, and that mothers of to-day will get along just as well as their mothers and grandmothers did before them.

There is a medium view to be taken, or, rather, it is more correct to state that many cases of even extreme injury will pass through the years of childbearing life and through the menopause without exhibiting any perceptible harmful effect; and, on the other hand, the gynecologist is every day surprised to find the potent influence for evil exercised over the general economy by a seemingly trifling injury, or at the wondrous complications that may arise in consequence of an apparently insignificant lesion.

Presumably, there will always remain a difference of opinion as to the interdependence of certain features connected with any given case,

[1] See *Am. Journ. Obstet.*, New York, 1882, xv., Suppl. 48, Dr. C. H. Thomas: "Laceration of the Cervix uteri simulating Cauliflower Excrescence for Fifteen Years; cure."

but all will surely admit that the gynecologist is the most competent to trace the bearing of one event on the other, and may be allowed to speak authoritatively on the subject.

In regard to prognosis we must take into account both those cases which have been left entirely to themselves and those which have had the benefit of care and treatment.

Taking, first, a case of laceration of average extent which has been entirely overlooked or ignored, what is likely to be the outcome of it? We may almost review our symptomatology and our pathological anatomy in mentioning the successive steps from health to invalidism which such a case travels. From the first there may be leucorrhœa, with erosion and eversion, the leucorrhœa being a persistent drain on the system, impoverishing the blood and opening the door for a succession of ailments due to malnutrition. There may be subinvolution with retroversion, prolapsus, or procidentia. The displaced uterus, carrying down the uterine appendages, will entail new suffering. The bladder will be dragged down, predisposing to cystitis and to the formation of calculi; besides which, the rectum being dragged upon, hemorrhoids and obstinate constipation will be induced. Dyspepsia, neuralgia, and various other reflex disturbances are almost constantly met with. All these symptoms may be so intensified that they become almost new diseases superadded to the old affection.

Looking at the laceration now simply as a solution of continuity, leaving out of the question the complications entailed, we have to deal with the results prone to arise from the constant irritation to which the exposed flaps are subject. Even though an ill result should happen only once in a hundred cases, we should not be justified thereby in neglecting proper precautions.

The exceedingly low vitality of such a part, and especially of the cicatrix, renders it liable to unhealthy action, not only when there is a reddened, raw, granular surface, but even when the surface of the flaps has been unbroken. The inevitable retrograde change in the tissues occurring at the menopause sometimes leads to improper cell-formation and carcinoma.[1] It is well, therefore, to advise a reparative operation or amputation in all cases of even moderate laceration when accompanied with marked eversion, or when with moderate eversion we find thickened lips filled with broken-down cysts and complicated with reduced vitality, or again in anticipation of the menopause, when, as we know, the vitality will be at its lowest.

We must next consider those cases which have received all the benefits of skilled attention.

If the case has been treated in a palliative manner—that is, if the

[1] "The Importance of the Cicatricial Ectropion of the Cervix and the Operative Treatment after Emmet's Method," Breisky: *Wien. med. Wochenschr.*, 1876.

erosion has been healed, the cysts emptied, the uterus raised in the pelvis, and all surrounding inflammatory action has been removed—there will seem to be a very good promise of continued well-being for such a uterus. Virtually, a cure has been effected, and the great difficulty consists in maintaining the condition at that point. Were this possible, few, if any, operations would be necessary. The trouble is, that as soon as treatment ceases the old conditions are restored and the old symptoms reappear.

Again, if a case has been virtually cured, and then operated upon to secure all the benefit so far attained, what is the promise for continued good health so far as the uterus is concerned?

In the first place, we may say, in regard to sterility and carrying to term, that in the large majority of properly-performed operations a decided success has been achieved.[1] Besides affections, such as prolapsus, cystocele, etc., which accompany the main lesion and yet require independent attention, we have to deal with symptoms dependent upon the cervical operation itself.

All of those referable to the presence of cicatricial tissue in the cervix have been overcome, and will, for all time, remain cured if the operation has been well and thoroughly done; those referable to the disease of the glandular structure will occasionally persist for some considerable time—that is, until the uterus has felt the benefit of the operation by being diminished in size and weight. Even then the cervical catarrh may remain troublesome and call for more energetic treatment than has hitherto been applied. Cystic disease likewise is apt to recur even for years after an apparently successful operation. Pouches develop about the os and the crown of the cervix, and by crowding the tissues they awaken neuralgic pains. A recurrence of these cysts does not necessarily imply an incomplete operation for their removal or an imperfect reposition of the everted lips. The disease will occasionally return in spite of the utmost care during operation, and I should regard such a result as showing not only that the condition of follicular disease is at times very much concealed, but also that in some cases this growth of glandular tissue, once begun, continues for an indefinite period, even after operation, and that we cannot get at the very bottom of the evil without removing the entire portion of the cervix which has been involved.

Satisfactory as the operation generally is, we must guard against deceiving ourselves or our patient with undue hope. Some of her sensations and pains will disappear slowly at best; the nervous symptoms will yield only as her strength returns. A markedly long con-

[1] See Dr. B. F. Baer's article in *Med. News*, Philada., 1883, p. 225: "Analysis of Twenty-seven Operations, etc. with reference to effect on Sterility and Labor;" also, Supplement, p. 724.

valescence should not discourage us, since many of our best results have followed months of uncertainty.

TREATMENT OF SUBINVOLUTION.—This affection is so especially dependent on laceration of the cervix that we might be led to expect a cure of the effect from a removal of the cause. Herein we should be disappointed, for this enlarged condition of the uterus, though engendered by the lesion, has become a separate individuality, and many chronic cases will remain hypertrophied indefinitely, or for a long time, in spite of a successful operation for repair of the cervix. Such a procedure is, however, requisite for a radical cure, for although we may succeed in reducing the enlargement, we cannot expect such a result to be permanent.

In the mean time, before the case is fully ready for operation, a great and important reduction can be effected in the size of the organ by preparatory treatment. We must aim to restore the uterus to its normal position in the pelvis and to retain it there by the natural suspension of its ligaments, rather than to bolster it up by an internal plastic procedure or by the external lifting and dragging of Alexander's operation. With so much to effect, and such positive means at hand of accomplishing our purpose, how can it be held that a case of laceration may as well be operated upon as soon as one meets with it, letting all preparation of the parts go unheeded?

One of the first indications to be met, then, is that of raising the uterus to its normal level in the pelvis and of holding it there. This is to be accomplished by freeing the organ from all superabundant weight in the way of clothing fastened about the waist, of pressure from a large abdomen or from an habitually over-distended bladder or rectum.

To effect the change in position we may either raise the organ on the tip of the finger, the woman lying on her back; or it may be better done, still by the finger, the woman having been placed in the semi-prone lateral (Sims') position, so that the intestines may fall toward the diaphragm; or, again, we may accomplish it by placing her in the knee-chest posture.

The organ will change position by its own weight when the patient has been so placed, but we may obtain additional force by allowing air to enter the vagina. Then we maintain it at its normal level by placing cotton pads beneath the cervix or by adjusting a properly-fitting pessary should other conditions of the case allow of its use. We should never lose sight of the importance of holding the uterus at this point while fulfilling all other necessary indications. Much will thus be gained in the way of reducing the size and weight of the uterus.

The instructions given at length in the section devoted to general treatment, if carried out, will also tend in the same direction; but there still remains much to be done.

If the case be one of long standing, in which the uterus is not only engorged periodically, but permanently, and the character of the tissues is changed, with development of connective-tissue elements and thickening of muscular fibres, we shall have to seek to undo these conditions to some extent. In addition to the degree of depletion which we may produce by horizontal rest and saline laxatives, we may be obliged to withdraw blood from the cervix. This we may do by leeches or internal scarification, either of which methods is of great assistance to the general depletion, or even necessary in addition thereto. On account of the absence of valves from the veins we cannot accomplish our purpose permanently by hot-water injections or change of position, for as soon as treatment is suspended the vessels refill almost immediately, and remain so on account of deficient tonicity. Local depletion, therefore, is useful in removing stagnant blood.

This scarification or application of leeches may be repeated every few days until we find that it has a decidedly beneficial effect. At the same time, or alternating with this treatment, we may stimulate the uterus to contract and improve the nature of its muscular fibre by inserting within the cervical canal a small pledget of cotton soaked in glycerin, or even a small tupelo tent. Its presence awakens expulsive efforts, as proven by subsequently finding the one or the other thrown out, and we may soon find that the body of the uterus is becoming smaller. With this method we combine the use of ergot in small and frequently-repeated doses, withholding it on the appearance of constant pain. While there yet remains muscular tissue susceptible of stimulation we may expect efficient aid from this drug, but if the muscular fibre has been largely displaced by connective tissue, we need not anticipate any benefit. A uterus in this condition will retain its abnormal size in spite of all efforts to reduce it.

Furthermore, we may blister the cervix with vesicating collodion, painting it over the cervix and allowing it to dry by exposure to the air. The discharge of serum thus produced will deplete the organ and also change the character of the everted mucous membrane of the cervix, which, if not eroded, will, at any rate, probably be the seat of enlarged glands with cicatricial induration.

Churchill's tincture of iodine swabbed over the surface and supplemented by glycerin dressings will be found of great assistance in furthering this object. This treatment may be repeated every second or third day, according to the tolerance of the patient and the effect produced, but the blistering need only be at longer intervals, say of two or three weeks.

We must not forget that the increased size of the uterus may be dependent on the common association of thickened mucous membrane with fungous growths in the parenchyma. Such a condition clearly

indicates the removal of everything of this nature by scraping or pinching with the spoon-curette. This process will be fully detailed in speaking of the general treatment, and need not be enlarged upon at this point. Some benefit may be obtained also by the local use of the galvanic current applied in moderate strength.

As a final and more positive cure of this condition we come to the operation of trachelorrhaphy itself, which, apparently by its healthy stimulation, establishes a change of nutrition by which the arrested involution is carried on to completion.

TREATMENT OF LACERATION.—The treatment of laceration of the cervix uteri may be divided into that which is palliative and that which is curative. The former includes those means, already considered in the section on Subinvolution, which serve to allay the troublesome symptoms, even when we employ them as preparatory to an operation. The latter includes the methods used for effecting a radical and permanent cure.

Palliative treatment may be undertaken from the very first moment of recognition of the lesion. If it be established, even during childbed, that laceration has taken place, it is essential at once to begin giving hot vaginal douches of an antiseptic character.[1] The douche should be administered to the patient in the position in which she lies, and that can be very readily accomplished by placing a bedpan beneath the hips and making use of a Davidson syringe beneath the bed-clothes. However it be accomplished, the douche should be copious and fairly hot—say, one gallon at a temperature of 105° to 110°; there need be no fear about checking the lochia. The antiseptic should be either a solution of bichloride of mercury, 1 : 3000, or of carbolic acid, 1 : 40. This douche should be given to the patient certainly every twelve hours, but it is far preferable to administer it every six hours.

There are several indications to be met by the use of this hot water with the disinfectant. We have seen in our previous consideration of this condition how frequently the cervix is bruised, contused, and lacerated after labor. The parts have been immensely congested, and, being so crowded in the pelvis, they inevitably retain this character for some considerable time. Then there are some parts which are absolutely destroyed; they break down and become a source of possible blood-poisoning. Then, again, the parts with full vessels—and, if lacerated, with open-mouthed vessels—are ready to take up what there may be of septic material, whether this be from the broken-down cervical tissue or from an unwholesome change in the lochia. The lymphatics also are ready to absorb any morbid material

[1] "On the Prevention and Treatment of Puerperal Septicæmia," by Dr. Thomas More Madden of Dublin—synopsis of paper sent to the Ninth International Medical Congress, reported in *New York Med. Journal*, Oct. 22, 1887.

present. Moreover, the plexuses of veins in the pelvis outside the uterus, the lymphatic glands, and the cellular tissue have all passed through a condition which leaves them most ready to yield to inflammatory action. Prophylactic measures are therefore most strongly indicated.

The hot water will serve to empty the smaller vessels, as it stimulates their muscular coat to contract, and they, in turn, act on larger vessels, which gradually become depleted, the combined effect being that we succeed in giving to the muscular tissue of the cervix some degree of contractility: it gathers upon itself, the uterus is raised in the pelvis, the torn parts are somewhat hugged together, breaches are closed; and the longer and more effectually this can be maintained the more we may hope that union by first intention will take place.

The antiseptic is an essential adjuvant, for it will not do to allow any material to lie in the neighborhood of the wound which is not absolutely sterilized. The hot water will not do this alone, and we must make sure that the result is accomplished.[1]

Even wounds of those parts which receive no treatment whatever heal often in the most remarkable manner, as shown by the numerous cicatrices found in women who have not complained at all: therefore is it all the more encouraging to hope for good results when we bring our methods of cleanliness and astringency to bear.

When a case has passed beyond this first stage, and we see it no longer in its freshness, but with the parts already returning to something approaching their normal state, we have still other conditions to treat. The eversion now becomes apparent, and with it, more and more as the case proceeds, we have the erosion.

The hot water which we have already made use of will continue to be beneficial, and so also will the disinfectant, notably the carbolic-acid solution, as an astringent. We cannot confine ourselves to these means, however. We must continually seek to maintain the uterus at its proper level in the pelvis, and, though this is accomplished to quite a considerable degree by the hot-water douches if properly given, yet we must further the object by placing nicely-fitting pads of cotton-wool underneath the cervix, so as to lift it from the floor of the pelvis. This cotton-wool, being soaked in glycerin and placed directly against the crown of the cervix, is a very soothing application and serves our purpose well, as the glycerin has a marked affinity for water, and so acts as a constant depleting agent on the capillaries of the cervix.

Special attention is also required by the erosion, which, if recent,

[1] "On Lying-in Institutions, especially those in New York," by Henry I. Garrigues, M. D., in *Trans. Am. Gyn. Soc.*, 1877, p. 592; "Antiseptic Midwifery," by Dr. H. I. Garrigues, 1886; "Antiseptics in Obstetric Practice," by Dr. W. L. Richardson, in *Boston Med. and Surg. Journ.*, Jan. 27, 1887.

will probably be cured by a thorough performance of the above operation, this beneficent result being secured by the depletion of the pelvic circulation and of the vessel-loops seen in this condition. We shall meet erosions in various stages, and we must be prepared to adapt our treatment to the individual case. In most instances the simple astringents will serve every purpose; for instance, I have repeatedly reduced a very angry-looking and extensive erosion from the violent red color down to almost the normal pink of the rest of the mucous membrane, while holding it in view with the speculum, the patient lying on the side, by simply throwing warm soapsuds against it with the gynecological syringe. It is a most interesting process of treatment to watch, and it is most convincing of the superficial character of this lesion, as well as being calculated to establish the fact that in most cases there is absolutely no destruction of tissue.

Such treatment, carried out for five or ten minutes, will prove most serviceable, but of course it is only temporary. When the patient stands on her feet again and the uterus settles down, the pelvic vessels are drawn upon and their calibre diminishes. The return of the blood is impeded, and the fulness will show in the capillaries of the erosion as it did before; so it is by constantly repeating the process and carrying out the other indications that we finally attain to good results.

Among many good agents for application to such surfaces we may mention the following: tannic acid in glycerin, ʒj–ℨj; pyroligneous acid, full strength; the impure carbolic acid or coal-tar of Squibb; Kennedy's extract of pinus canadensis; muriated tincture of iron; Monsel's salt; and iodoform.

At the same time that we treat the erosion we must seek to overcome the eversion. This we accomplish partly by raising the uterus and partly by packing cotton around the edges of the cervix, being careful not to make too much pressure on the vaginal walls, lest we check the venous return and thus defeat our object.

Bilateral laceration is sometimes accompanied by enormous eversion, and we may be tempted to replace the parts and retain them in normal position until operation, by means of a silver stitch passed through both lips, with the ends twisted in the median line. This procedure virtually closes the cervix temporarily. When the lips are very thick, excessive traction on the suture may cause it to cut out, and we may repeat the operation, but we generally find ourselves obliged to desist, because the lips simply become more and more injured. I have repeatedly used this method, hoping that the compression of one lip on the other would diminish the thickening by promoting absorption; and although I have thought that an obstinate erosion was improved by rolling the lips over and by the direct pressure, the operation has

counterbalancing drawbacks. The closure of the cervix prevents the treatment of diseased glands in its walls and the emptying of deeply-lying cysts, so that when we come to operate radically we find much more to be done in the way of preparation than we had been led to imagine from external appearances. These glands and cysts claim a goodly share of our attention.

Ordinarily we do not see these injuries until the congestion of the pelvis has become well established and the cervical glands have begun to pour forth their contents. This pathological secretion has then become a habit of itself demanding treatment. Our first duty is to remove the discharge, which is often so tenacious that it will cling in the mouths of the open glands in spite of our efforts. The best mode of effecting the purpose is to insert into the canal a small piece of dry sponge grasped by the forceps, and to rotate it so as to engage the tough mucus in the interstices of the sponge. Sometimes we may succeed in drawing the discharge into a very tight gynecological syringe provided with an open mouth.

Making an application of carbolic acid will so coagulate the albuminous mass that we can even grasp it with a pair of forceps, but this application changes the underlying tissue as well, and interferes with our proper appreciation of the condition. For subsequent treatment, however, this plan answers remarkably well. Should the discharge be thin, it need only be removed with a scrap of absorbent cotton held in the forceps.

When this is accomplished and we have an opportunity to inspect the diseased surface, our object will be to apply whichever substance will the most readily aid in reducing the amount of discharge and promote healing of the hypertrophied glands. Churchill's tincture of iodine or carbolic acid has been found to be the best. Each is powerfully antiseptic; the iodine is alterative as well, and the carbolic acid is escharotic. One might suppose that so strong a solution of iodine (iodinii, grs. 75; potass. iodidi, grs. 90; spts. vini rectificat., ℥j) would be too irritating to so diseased a surface; but the very nature of the disease calls for a stimulating application, the glands, though active in yielding a secretion, being yet sluggish in fact, and therefore well disposed to bear an irritating substance. Even this will oftentimes not suffice, and we find it necessary to change the character of the tissue completely, or even to destroy the more superficial glands by scraping the surface with a curette, dull or sharp depending on the severity of the case.

This latter procedure, if properly carried out, will scarcely be called for more than once in any given case, but the iodine or carbolic acid will have to be applied every second or third day for a long while. It is useless to make such applications more frequently, for the tanning of

the surface which we effect will not pass away within forty-eight hours, and it may be longer.

It is possible that these two methods will fail to bring about the desired change, in which case we shall be obliged to resort to the use of chromic acid or fuming nitric acid, or to count upon overcoming the difficulty by excision of the diseased glands when we come to operate.[1]

With these diseased glands we have also the cystic formation about the crown of the cervix and along the edges of the laceration. To rid the tissues of these it is necessary to puncture every one with the Buttle spear or bistoury. The lance-shaped spear answers rather the better, since the blade widens out on both edges from the tip, and thus cuts the cyst-capsule in both directions from the point at which it enters. These cysts should be opened daily or on alternate days wherever found, and their cavity touched with some irritating substance which will promote their healing. Churchill's iodine should be applied over the whole surface with a piece of cotton, after which the cervix is to be dressed with a cotton pledget soaked in glycerin, which will provoke a watery discharge by exosmosis, as was stated in the section on erosion. Such treatment pursued for weeks will restore the surfaces to normal condition. There may still be a lurking pelvic inflammation and an induration of the angles, causing enlargement of the part, which must be watched to prevent return of all the symptoms.

It will be noticed that no mention has been made of the nitrate of silver as an application to these diseased surfaces, and purposely so. I would still ignore it unless to warn against its use.[2] Those who from remote times have sought its aid have perhaps felt there was reason to congratulate themselves on the effect obtained by its use; and, to all appearances, its effect is beneficial—speedy covering over of these eroded surfaces and rapid healing—but the result is no more lasting than it is from the treatment indicated above, and it has the disadvantage of a surface which is pathological in reality, though pleasing to the eye. The mucous membrane is really indurated, and nerve-filaments of the sympathetic, being imprisoned in such tissue, will speedily lead to injurious reflex effects.

We must not allow ourselves to be deceived by apparently normal surfaces secured by the use of nitrate of silver, or otherwise. Unless the cause of disease is removed we shall witness a succession of complete relapses, which will prove our treatment to be valueless until

[1] "On the Relation of Lateral Cervical Lacerations to Catarrh of the Cervix uteri, and the Necessity for Emmet's Operation," by Prof. C. Schroeder, in *Am. Journ. Obstet.*, New York, 1882, xv. 538–545.

[2] See, as opposed to this opinion, "Notes on the Treatment of Recent Lacerations of the Cervix uteri," by Ellwood Wilson, M. D., *Trans. Am. Gyn. Soc.*, 1886, p. 94, and discussion.

it is completed and rendered permanent by an operation for closure of the laceration.[1] An opportunity to compare a case treated palliatively with one treated by operation will remove all doubt as to the advisability of the course recommended.

Nor does it seem to me that repair can ultimately take place as well in a case which is far removed from the normal. Having always put patients through this course, I have not had the opportunity to witness the results after the other method, but still cling to the belief that it is not as rational a mode nor as beneficial, unless, indeed, all the diseased tissue be removed, in which case we are still further and uselessly diminishing an already atrophied cervix.

The preparatory treatment of necessity includes also that which is directed against the inflammatory complications, past or present—cellulitis, peritonitis, lymphango-adenitis, etc. It would manifestly lead us too far to consider the treatment of these conditions at length, however, and, just as in the section on Complications I referred the reader to their consideration elsewhere in this work, so at this point will it suffice to refer again to such matter. The treatment of involution I have considered by itself, and somewhat at length, since it is an almost inseparable part of lacerations, whilst the other complications are mostly accidental.

So far for the local care, but how manifestly inadequate would all this prove to be were we to content ourselves with our effort in this direction and neglect the accompanying anæmia, the nervous exaltation, the depressed spirits, the loathing of food, the faulty digestion, the habitual constipation, and the sleepless nights! How blind would the physician be, and how unskilled in the management of such a case, were he to lose sight of his part as a general practitioner and magnify his importance as a specialist! Iron, beef and fats, repose, diversion and change, fresh air, digestives and wines, laxatives, massage, and baths, are so many means to bring to bear on these poor invalids to aid in restoring their general health. If these, and the surgical means also, are not properly carried out, the patient's constitution will almost surely break down. What was true when Dr. J. Henry Bennet wrote more than twenty years ago is as true to-day—viz.: "The anæmia and debility which uterine diseases constantly produce are, through their reaction on the digestive and nutritive functions, powerful predisposing causes to pulmonary consumption, especially when there pre-exists any constitutional tendency;" and further: "Lesions which lower vitality, such as uterine lesions, both lead to its development and prevent its arrest and cure when once it has established itself."

We have now established the necessity for preliminary treatment

[1] "Notes of Two Hundred and Thirty-one Cases of Operation for Laceration of the Cervix uteri," by T. A. Reamy, M. D., in *Med. News*, Philada., 1884, xliv. 531–533.

and given it thorough consideration, and it becomes proper to discuss the indications and time for the operation.[1]

There are, of course, many cases requiring no treatment, but these we may generally classify as fissures. We must bear in mind, however, that some apparent fissures may have been extensive lacerations, partly healed and possibly with cicatricial tissue; others may be large internal rents presenting merely a fissure at the surface. In other cases the indurated and sensitive angle of laceration will be very marked and easily detected from the first, and in these there can be no question as to the necessity of removal of such a foreign body as a cicatrix. In another class, do what we will in the way of treating the enlarged and weighty uterus, we cannot reduce its size unless we resort to this operation. Why this result should follow we cannot explain, even on the hypothesis of a revulsive effect. We may, nevertheless, count upon it as confidently as after an operation for complete removal of the cervix. Another object to be attained by the procedure is the prevention of repeated abortions by restoration of the inner circle, the sustaining part.

We shall frequently find that during the preparatory treatment we have maintained the cervix so clear of mucus that a woman becomes impregnated in spite of our wish that she should not until she is well, her previous history showing that she will surely abort. What are we to do in such a case? Our remedy still lies in operating, and we are enabled to do so without disturbing the pregnancy.[2] All that is necessary is that we do not put it off until the uterine circulation has become so active that we are in danger of having much hemorrhage or of exciting uterine contractions. In the first three months it may be done with safety.

Finally, the operation is resorted to for the purpose of *keeping* the woman well when she has been cured of the accompanying eversion, erosion, and cervical catarrh.

If the operation seems advisable, I know of no contraindication except a pelvic inflammation.

Operation.—It is necessary to have the bowels thoroughly emptied by a couple of compound cathartic pills given the evening before, or, if the bowels have been in good condition, by an enema of soapsuds. Also, because of the anæsthetic, it is essential to have the stomach empty at the time of operation. One hour or one half-hour before the time set for the operation it is well to have an attendant give the patient a fairly copious and very hot antiseptic vaginal douche. This

[1] "The Proper Limitation of Emmet's Operation for Laceration of the Cervix uteri," by C. C. Lee, M. D., in *Med. Rec.*, New York, 1881, xx. 78–80. See also discussion of the paper by Drs. T. A. Emmet, Pallen, Polk, Mundé, Putnam-Jacobi, and Wylie.

[2] "Surgical Operations on the Pelvic Organs of Pregnant Women," by Matthew D. Mann, A. M., M. D., *Trans. Am. Gyn. Soc.*, 1882, pp. 363–367.

will deplete the hemorrhoidal system and prevent free bleeding during the operation; besides, it will remove from the parts any possible source of infection which might endanger success.

We need not consider here any of the various methods of operating except for the purpose of cautioning against the dorsal position. With the patient on her back the uterus, if sufficiently mobile, may be drawn down until the cervix reaches the vulva, but we secure no advantages not possessed by the Sims position. On the contrary, there are many disadvantages which may interfere with a successful operation, such as the liability to irritate a latent peritoneal thickening, the strain upon the uterine ligaments which we have recently tried to strengthen and shorten in order to cure a retroversion, and, finally, the danger of effecting a change in the relations of the cervix and vagina.

If there has been a procidentia of long standing, itself remotely caused by a laceration, and it is desirable to restore the cervix as a link in the chain of measures necessary to overcome this displacement, it is entirely justifiable to do so; but even here the rational physician will have restored the uterus to its place in the pelvis long before he thinks of operating, and in such case he would have no thought of again bringing the cervix to the outer world.

So we shall assume that the cervix is to be operated upon *in situ*, the position chosen that of Sims, the patient lying on her left side, or on the right, the undermost arm placed against the back, and the knees drawn up as much as possible. This position, commonly called the semi-prone lateral, gives us the best opportunity to expose the cervix to view and allows the uterus to be the most free in the pelvis. It, however, sometimes cramps the patient, especially if she is fleshy or subject to any difficulty of respiration, and all the more when she is to take an anæsthetic; but by placing the uppermost hand flat on the operating-table, near the chest, and so lifting the elbow, the shoulder of that side will be well raised and the chest will be comparatively free from compression.

Anæsthetics, as a rule, are used, and yet unnecessary, as the operation is not painful. Nevertheless, it may be advisable to put the patient to sleep to save her from the exhaustion of a long operation and to secure full control over her. In the earlier part of the operation, and until the perineum yields to the necessary pull upon it, the pain thereby excited may cause the woman to interfere with our procedures by contracting the perineal muscles. Therefore it is well to employ an anæsthetic, unless there is a strong contraindication,[1] such as advanced

[1] Dr. T. A. Emmet in 1866 called attention to the dangers attending the administration of ether in patients suffering from Bright's disease. See also article on same subject in *Med. Record*, New York, March 10, 1883, by Dr. R. Van Santvoord: he also mentions many cases from other authors, showing the ill effect, others showing that it has proven harmless. See also Millard, H. B., M. D., *Bright's Disease*, 1886, p. 247.

kidney disease, or marked organic heart trouble, or catarrhal bronchitis. We must carefully watch for any harmful effects from the combination of morphia with the anæsthetic. Everything may go well until the introduction of the speculum, when, from excessive pain excited directly by cicatricial tissue about the perineum or by reflex from the same cause, the patient may become unmanageable and require morphia. Accidents from dangerous narcosis are then prone to occur, and must be prevented by careful watching. A similar rule should prevail in case we have attempted the operation with morphia alone, and subsequently find it necessary to employ an anæsthetic.

Cocaine in 10 per cent. solution has also been used as an anæsthetic by direct and constant application to the cut surfaces. On account of the comparative insensibility of the parts to be cut we may be mistaken in attributing good results to this agent, and we could only expect information on this point from the details of its employment alone in a case which had been painful at the outset. It has also been successfully used by injecting into the substance of the cervix with the hypodermic syringe.

The anæsthetic should be administered to the patient lying on her back, as respiration is easier in this position. It is essential to use as little of the drug as possible, and the quantity necessary will depend more on the judgment of the anæsthetizer than upon any apparatus he may employ.

The operation[1] is begun by placing the perineal retractor in position and bringing the cervix into view by the depressor. The lower edge of the lip to be denuded is seized by a tenaculum which catches up the mucous membrane at the point at which it is to be removed, and the scissors engage the tissue back of the tenaculum and remove a strip as far up into the canal as is deemed necessary for the proper apposition of the parts. When the anterior and posterior lips of the lower portions have been pared, we proceed similarly with the upper portion if the rent is bilateral. It is essential to remove as much mucous membrane as will bring the two sides of the cervix together, leaving only sufficient undenuded in the median line of both lips to form a canal of natural size and uniform calibre.[2] This undenuded strip should be wider at the crown than higher up, because of the difference in the degree of involution which will take place. Should the lips be very thick and the rolling out very marked, it will be well to

[1] I will not occupy the space nor take the time of the reader to describe the various instruments in use for this operation. Speculum, depressor, tenacula, scissors, needles, twisters, forceps, shield, and feeder will be all found pictured in Vol. I. of this work in the article "General Consideration of Gynecological Surgery," p. 328, by Dr. E. C. Dudley.

[2] "Another Modification of Emmet's Cervix Operation," by R. Stansbury Sutton, A. M., M. D., LL.D., *Trans. Am. Gyn. Soc.*, 1886.

remove sufficient of the tissue to make the adjustment of parts more perfect.

When the mucous membrane is all removed, we excise any cicatricial tissue found in the angles of the lacerations. At the first touch of the scissors it often appears that we have to deal with an uncommonly soft tissue; indeed, the mucous membrane on the vaginal side is thicker at this point than elsewhere, since the underlying structure, being more dense than normal, interferes with the circulation, and in that way makes the parts infiltrated and puffy; so that this condition may often be taken as an indication of what we shall find underneath. It is necessary now to cut somewhat boldly and deeply up to the limit of the laceration, having first seized the angle with a firm tenaculum from within the canal, and having drawn it well up to the level of the denuded portion.

I consider it far better practice to cut inward toward the uterine canal when removing this cicatricial tissue than to cut through the cervix and vagina, as is sometimes done, as the latter mode is unnecessary, involving as it does the outlying cellular tissue. There is danger of opening into a vessel of considerable size, which will prove difficult to ligate; and in case of faulty union as the outcome of the operation, there will be an ugly gaping wound into dangerous parts or a granulating wound with ultimate cicatrization far more extensive than anything resulting from the confinement.

When all the hardened tissue resembling cicatrix is removed from one or both sides, we may proceed to close the wound.

Though we may not, up to this moment, have made use of any special antiseptic means, though, of course, everything we handle should have been aseptic, yet I would advise operators to meet the views of others practising in this line by thoroughly washing the denuded surfaces at this stage with a 1 : 3000 solution of bichloride of mercury. This can be done by means of a stream turned against the cervix or by the aid of a sponge probang thoroughly soaked in the solution.

The next step will be the introduction of the sutures: silver wire is the material used, and I am quite confident, all things considered, that it forms the best suture for this purpose that we have. Should we propose to close the perineum at the same sitting, catgut sutures may be used, for the reason that we thus avoid having to make any traction on the new perineum for the purpose of removing them, as they will dissolve; still, even then wire may be used, for if properly applied it may remain in position indefinitely, and be removed at any time after the perineum is thoroughly strong.

The disadvantages of catgut are, first, the difficulty of tying knots up in the vagina; second, the liability of an important stitch to give way by the knot loosening; third, the possibility of the catgut dissolving

before union is complete; and lastly that it may not be free from bacteria.

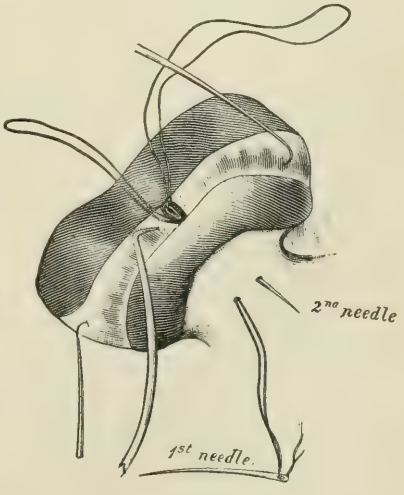
The advantages of the wire are—that it is easy of application, is perfectly secure for all time, and acts as a support to the newly-approximated surfaces, as each suture is made to lie against the cervix, and so, in a measure, to clasp it; furthermore, it is absolutely clean and unirritating.

Silk and silkworm gut have also been used, but offer no advantages over the above.

In considering the mode of passing the first suture in such cases we must keep in mind the extent of our denuded surfaces, and realize that, if we have had to remove much at the angle within the canal, our inner denuded portion will be at a much higher level than the outer or vaginal denudation. Now, as it is essential that we control any possible bleeding by our first stitch, we must make sure that it reaches fully to the limit of the angle, and for that purpose we are obliged to pass it in a slanting direction from the vaginal side well up into the cellular tissue before penetrating the cervix. To make doubly sure that it circumvents the angle, we drag the latter again to the surface, just as we did when denuding it. This is not at all an easy part of the operation, for in seeking to force the point of the needle toward us to catch it, in order to draw it along, it is apt to break, and not only one but successive needles when we attempt to repeat the manœuvre.

To give ourselves more room, and thus to facilitate the insertion of this first stitch, a better method is to pass it from within outward; it is easier to guide the point of the needle to a given level on the vaginal side than to a fixed point within the canal. This latter method requires two needles for one stitch, dragging in each end of the silver wire after they are both passed, thus making it continuous. The second stitch is to be of the same kind where it has been necessary to cut deeply; the third and subsequent ones, however, may be passed in the manner first spoken of—namely, from without in, inserting the needle at one-eighth of an inch from the edge, and bringing it out on the canal side directly at the edge of the undenuded portion, each thread in turn dragging a silver wire with it.

FIG. 201.



The deeper the inner incision has been, the more the sutures will radiate from without in, being rather close together on the vaginal side, but spreading out toward the canal.

FIG. 202.

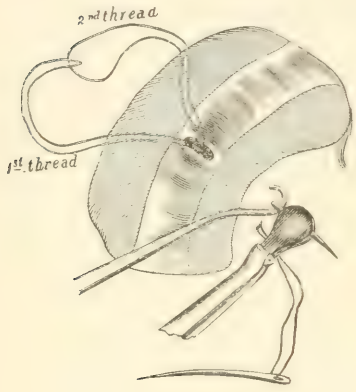
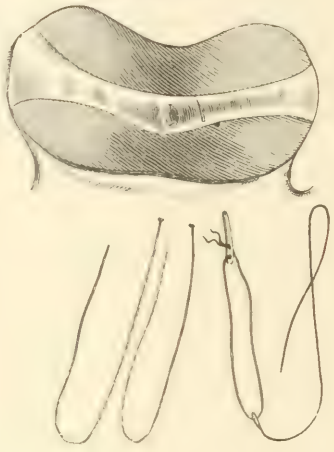


FIG. 203.



It is well to begin passing the stitches on the lower side, just as we began the paring, so as not to be bothered with blood flowing over our work, which would surely be the case had we denuded the upper side first. There is oftentimes considerable bleeding from passing the needles also, especially if they be spear-pointed or triangular.

Another point worth noting is that the deep sutures of the two sides should be passed before completing either one, otherwise we shall find it impossible to open out the lips sufficiently to reach our deep angle.

The stitches should not be more numerous than will just suffice to hold the parts together nicely without gaping intervals. If too many are introduced, they cut off the blood-supply of intervening spaces and we are apt to create suppurating points.

It is not amiss to go over the raw surfaces again with the antiseptic solution, though it cannot now reach all the parts as thoroughly as before.

We then begin to twist the sutures, and begin with the uppermost on either side, so as to bring the two inner edges of the wound in perfect apposition at the deep angle. It is desirable not to make excessive traction on this first stitch, because it includes a considerable amount of cellular tissue in the broad ligament, and is sure to cut through it, and possibly through some vein in the same region. Do so as lightly as we may, we still commonly find at the time of its removal that it has become considerably imbedded, and very often is lost in a great gash.

This leads me to mention one other detail, which is that we should leave the first one or two stitches excessively long—say an inch and a half—so that we may be sure of finding the ends when we wish to remove them.

Each suture as it is drawn upon sufficiently to bend the wire on the inner side, thus making sure that the two denuded surfaces are touching, should be again bent over at the outer level of the wound, so that when it is twisted the parts will not be drawn up any tighter than we wish to have them. This makes all the stitches uniform; and with this device it matters little how irregularly the stitches may be passed from the outside. This result is doubly secured if we make proper use of the shield and bend the wires over its edge, twisting with our forceps until the two cross just over the wound. If now, while holding the wire securely with our forceps, we place a tenaculum against the base of the twist and make counter-pressure, bending the wire over the tenaculum until it lies flat on the cervix, we shall secure a perfectly snug position for the suture and obtain the splint effect spoken of above.

Once more we make counter-pressure at the point at which we wish to cut off the wire, about half an inch from the line of union, and snip it with our wire-scissors just within the bend so made.

Each suture, in turn treated in this manner, will secure for us a very satisfactory result. Care must be taken to twist the wires only moderately tight, as œdematous swelling is sure to take place, and they will be deeply buried, producing a certain amount of sloughy discharge in the bed of each one.

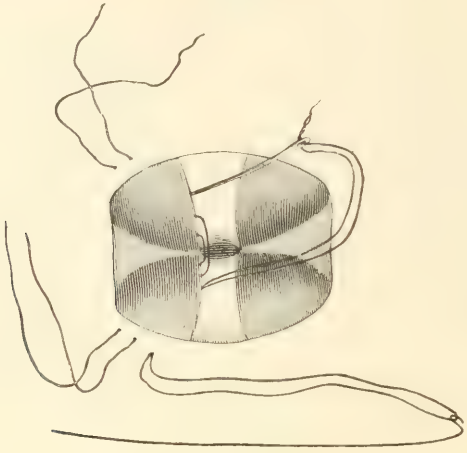
This completes the description of the operative procedure for a simple unilateral or bilateral laceration. But as there are many varieties of laceration, so, of necessity, are there many variations in the mode of operating which every one will, more or less, have to adapt to his own uses according to experience.

In a case of stellate laceration, instead of obliterating each fissure separately, we should group them in a unilateral or bilateral operation by excising the smaller nodules in wedge shape and bring the fresh edges together. We are here guided by the principles which lead to operation in any case.

A double laceration with one angle free from cicatricial tissue and without eversion is best treated by leaving the free angle as an improvised os and closing only the opposite side. This rule is not to be blindly followed, however, since the condition of the cervical glands may forbid such a course; yet we must remember that it is better for the patient if one operation can be made sufficient. When the cervix has been very much thickened with glandular hypertrophy it is generally undesirable to close both sides at once. However much of this tissue may be cut away, if an undenuded canal surface is left, that portion will be much

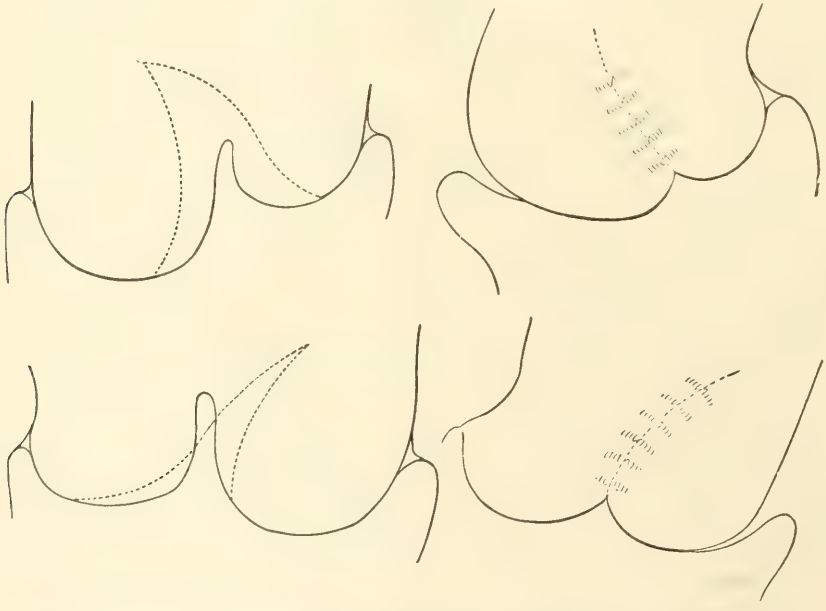
thicker than the rest, and will form the apices of two cones, as shown in the accompanying illustration.

Fig. 204.



If both sides are united, the result will be that one or both sets of stitches will cut out. Under such circumstances, if the case must be

Fig. 205.

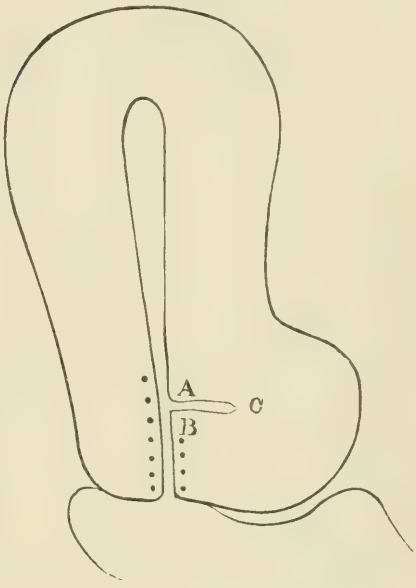


operated upon it is better to unite one side, and later, when involution has proceeded somewhat, to undertake the other.[1]

[1] See Sutton: *loc. cit.*

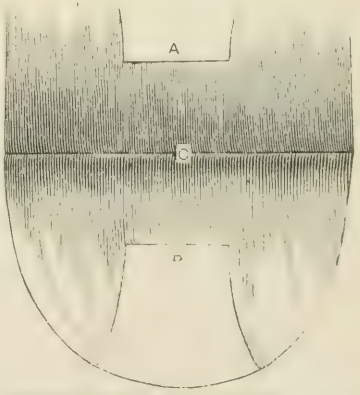
FIG. 206.

FIG. 207.



If one lip is longer than the other, it will remain so if brought together in the ordinary way. It is essential to have the sides equal in length, and we accomplish this by shaping a false angle, as shown in Fig. 208. The longer lip will be brought to an exact fit by sutures begun at the apex of the false angle. I have operated on a case exhibiting such disparity as to require the longer lip to be doubled on itself (Fig. 207). A few months later the cervix had acquired a much more shapely contour than would seem possible from this diagram, and the two surfaces formed by doubling had completely adhered, so that the canal along A and B was perfectly continuous and without a sinus toward C.

FIG. 208.



Anterior Lip seen in full: blank space represents the mucous membrane left for the canal. A and B are to come together when the lip is doubled on itself at C.

In such cases we are at first inclined to remove the anterior lip, but further consideration will show that this is only an apparent hypertrophy, and that its ablation would include the vaginal attachment and possibly lead

to an accidental wound of the bladder, which the sound proves always to be carried down with the vagina.

Now that the operation is completed, care must be taken to see that the uterus is in its proper position, for, apart from the tendency to retroversion which exists in many of these cases, we are most liable in a difficult operation to displace this organ backward by the unavoidable dragging upon it. Whoever has had a really troublesome case to deal with, thickened and indurated lips through which it is wellnigh impossible to pass a needle of any kind, will readily appreciate the bearing of this caution. Gradually and insensibly, guard against it as we will, the uterus has been drawn down farther and farther, and of course the suspensory ligaments have been drawn upon also, and, unless they are entirely sound and elastic, they will yield and will not raise the uterus to its position again. So we are obliged to replace it, and then to see that it remains in position. This can be done with the patient still on her side by simply forcing the cervix well up in the posterior cul-de-sac, or she may be turned upon her back, in which position one can make use of the two hands to effect the same purpose.

The patient is now to be put to bed and every means taken to prevent nausea, which tends to reproduce the retroversion should it have occurred, and also to strain excessively the deep sutures which bind the vagina up against the supravaginal portion of the cervix.

A method of stopping this vomiting, introduced some years ago at Bellevue, I think, has many times proven successful in my hands—namely, giving 30 grains of the bromide of potash before the operation, and repeating the dose as soon after the operation as the patient is able to swallow.

From this time on the woman is to be kept absolutely quiet and such treatment adopted as will the most positively keep down all inflammatory action. The hot douches are to be given twice daily, with the antiseptic added. The diet is to be simple; the bowels are to be kept open; and, with all this, any undue amount of pain which the douches fail to overcome may be allayed by anodynes given with discretion. Instead of using antiseptic douches, some operators prefer to put into the vagina, on and around the cervix, a quantity of iodoform or iodoform and boric acid. This "dry dressing," as it is called, has many advantages, and those who use it claim most excellent results.

The sutures may remain in place from one week to ten days or two weeks. Sometimes the parts heal in a few days; at other times they take considerably longer; and as the sutures do no harm, it is better to leave them undisturbed for the full fourteen days. In removing them it is well, after hooking up the end and seizing it with a wire-

forceps, to cut the loop on the side nearest the operator and to withdraw the suture toward the same side, since we thus press the uniting surfaces together, instead of tearing them open, as we are prone to do if we draw upon the stitch in the opposite direction.

Should the healing not be complete at any one part, it is desirable to leave the necessary stitch or stitches still longer; should any one stitch have cut out and allowed the wound to gape, thus giving a granulating surface, it is well to pass another suture or two, as may be required, to bring the parts together again.

It is generally supposed that primary union cannot take place after granulations have formed—that they, in fact, are the basis of secondary union or healing by cicatrization. This is not strictly the fact, however. I vividly recollect two cases in which on the tenth day, at the time intended for the removal of the stitches, they were found hanging loose, having cut out on one side, leaving the wound entirely open and covered with granulations. Rather than allow matters to stand thus, new sutures were passed precisely as at the first sitting, except that they had to be set farther back from the edge, and the result was perfect after another fortnight, with no trace whatever of any cicatrix or hardened tissue.

After removal of the stitches, the patient is again put to bed and subjected to the same antiphlogistic and antiseptic treatment. In favorable cases we may allow her to begin to sit up after another period of a week or ten days, according to her strength. The food must be gradually increased to regular meals at the time of her getting out of bed. From sitting up to walking and driving is but a step.

Accidents and Complications of the Operation.—Provided the operation has been undertaken at the right time, not immediately before a menstrual epoch, but after, and has been conducted antiseptically, we may be pretty well assured that nothing will go amiss.

Apart from the development of inflammatory complications, nothing is likely to happen except hemorrhage. Bleeding from the angle cannot well take place if we observe the precaution detailed in describing the manner of passing the first stitch. But it happens, at times, that a vessel may be severed, even after several days, by the sloughing through of a suture—not, of necessity, because it was twisted too tightly, but because the swelling of the parts has made it act just as if it were.

While mentioning this circumstance it is as well to point to the remedy. It would be a pity to destroy the entire operation in order to reach the bleeding point, so we may well follow a plan devised, I think, by Dr. T. A. Emmet for the positive arrest of the hemorrhage. Hot water or a tampon may be tried, but if the hemorrhage be arterial and flow from the uterine canal, the chances are that neither will prove successful. The sure method of controlling it is to pass a stitch through the

cervix, as high up as we can reach, and twist it about one side of the neck. If the bleeding vessel be within its loop, we thus control it; should the flow not cease, it is because we have not got the artery within our grasp. Now untwist the suture and swing the two ends, still held by the forceps, over the crown and on to the other side of the cervix; now twist again, and this time the control will be absolute. Such a stitch may remain for two days or longer. It will readily be seen that it would not do to leave both halves of the cervix clamped in this way, for the constriction would entail a slough; but one stitch cannot harm the half, as the anastomotic supply will be sufficient nourishment.

Should the denuded surface not be sufficiently wide, or should the tension on the sutures be too great, we are most apt to have only partial union; and that not in the length, as might be supposed, but in the thickness of the cervix. For instance, the mucous membrane of the cervical canal and the mucous membrane of the vaginal side may be perfectly united, and yet the substance proper of the cervix may stand apart as before, even with the edges curled up anteriorly and posteriorly. This is very commonly met with as a result of imperfect operative skill.

Another result, not much less common, is where we have the outer portion of the wound thoroughly brought together, but the inner edges still flaring: there is only union of a part of the denuded surfaces, the outcome being that we have a condition very similar to that described as circular or concealed laceration.

With the first we may have a persistence of most of the old symptoms, notably those of nervous origin, and it may be that the operation will have to be repeated. In the second case there will be a continuance of the cervical catarrh; it may be even more marked than before, since we have exposed more surface by denuding, and there will be no doubt in this case of the necessity for a second operation.

CHRONIC INVERSION OF THE UTERUS.

By SAMUEL C. BUSEY, M. D., LL.D.,

Washington, D. C.

Definition.—Inversion of the uterus consists in the turning of the inside of the organ out, by which the endometrium becomes the investing, and the peritoneal covering the interior, coat. This form of displacement cannot, however, as maintained by the earlier and, most generally, by recent authors, be limited to the fundal and lateral modes of inversion, in which either the fundus or walls are first to enter and descend through the cavity, and either partially or completely escape through the os, but must comprehend cervical inversion, when the lower part of the uterus is first to extrude, "with rolling out of the body and afterward of the fundus."[1]

The various grades of this affection, expressive of the degree of inversion, which have been described by authors may be conveniently classed as either complete or incomplete—complete when the uterus is entirely inverted on itself, with the fundus, body, and cervix hanging from the os in the vagina;[2] and incomplete when there is simple depression[3] of the fundus, introversion of the walls, invagination of the fundus or walls, penetration of the inverted portion through the cervix, and even partial escape through the os. In those very rare instances of inversion by eversion of the cervix, any degree of the displacement

[1] Reeve: *Gynecological Transactions*, vol. ix. p. 75.

[2] Hart and Barbour (*Manual of Gynecology*, p. 366, London and Edinburgh edition) state that inversion in simple, uncomplicated cases "extends as far as the os internum, but no farther. The uterus lies partly in the vagina, partly in the cervical canal. Its neck is embraced by the os externum, which may lie loosely on it or constrict it firmly." Again, at p. 367, they assert that the cervix uteri "is rarely displaced in simple, uncomplicated inversion; it forms a broad ring embracing the neck of the tumor. Sometimes the inversion is complicated with prolapsus, or, more properly, the vagina also becomes inverted, and the inverted uterus caps the inverted vagina. When this occurs the cervix uteri is more or less inverted; a part remains just above the os externum as a depressed ring, which also disappears on making traction on the uterus."

[3] The slightest degree of partial inversion is present when any portion of the entire thickness of the walls of the uterus becomes convex toward its cavity or interior, without going to the extent of being invaginated or brought within the grasp of the rest of the uterus (Crosse: *Trans. Provincial Med. and Surg. Ass.*, vol. i. p. 293, 1845).

short of extrusion of the body and fundus should be classified as incomplete.

VARIETIES.—Inversion of the uterus may be puerperal, non-puerperal, acute, or chronic—puerperal when associated with abortion, miscarriage, or parturition; non-puerperal when occurring in an unimpregnated uterus. The subdivisions into acute and chronic should relate to the duration of the interval between the occurrence of the accident and the beginning of treatment, rather than to the rapidity or slowness of the process of inversion. The terms "sudden" and "gradual" would more definitely express the process of development.

The puerperal variety comprises about 87.5 per centum of all the cases; Aveling and West rate the proportion at 7 to 1. Of the 224 cases of inversion following parturition collected by Crampton,[1] 196 are noted as having occurred "at once;" that is, simultaneously with the termination of labor. Of the remaining 25 cases, in 12 the accident occurred during the first hour after labor; in 7 during the first day; in 2 during the first week; in 2 during the first month; in 1 during the fifth month; and in 1 during the thirteenth month. The direct causal relation of parturition and the puerperal period to the displacement is thus very clearly demonstrated.

The distinction between the acute and chronic cases should be established upon some pathological basis, rather than with reference to the time of occurrence or duration of the process of inversion; otherwise the number of cases of chronic inversion would be, comparatively, very small, and be almost exclusively limited to the cases occurring in the non-puerperal womb. Winckel states that about two-thirds of all the cases of puerperal inversion are chronic. Of the 196 cases noted as occurring "at once," Crampton classifies 100 as acute and 96 as chronic. This distribution is determined by the interval between the time of occurrence of the accident and the beginning of the treatment, which for the acute is limited to thirty days, thus corresponding with the ordinary duration of the puerperal period, during which time the retrogressive changes in the uterus are going on and are probably completed before its expiration. So far, then, as regards puerperal inversion, the terms "acute" and "chronic" possess special significance, inasmuch as they distinctly differentiate the cases subjected to treatment during the process of involution from those in which it is delayed until those changes in the inverted organ have been at least partially completed. A classification based upon this distinction separates the cases by well-known pathological conditions referable to uterine involution, and bears a very important relation to the duration of the suffering of the patient and to the method of treatment. Among

[1] *Amer. Journ. Obstet.*, vol. xviii. p. 1148. All of these cases occurred or were treated after the publication of Crosse, and are therefore more valuable.

the chronic must also be classed those inversions caused by (Winckel) tumors, especially myomata, either polypoid or sessile. Hart and Barbour say inversion is "peculiarly frequent in sarcoma," but only in a single instance has it been found associated with carcinoma uteri. Crosse reports the case of Thatcher, in which inversion was produced by the "expulsion of hydatidous masses formed within its cavity."

Frequency.—It is fortunately a very rare accident. Authors differ in regard to the ratio of frequency. Madden rates it at one in 190,000 cases of labor; Reeve, at 1 in 140,000; and Aveling, at 1 in 100,000. In the Vienna Lying-in Hospital from 1849 to 1882, in a total of 280,000 labors, but 1 case occurred. Puerperal inversion is the most frequent. Next in order of frequency are those cases produced by uterine tumors, about 10 per cent. All other causes combined do not yield more than 2.5 per centum of the total number of cases.

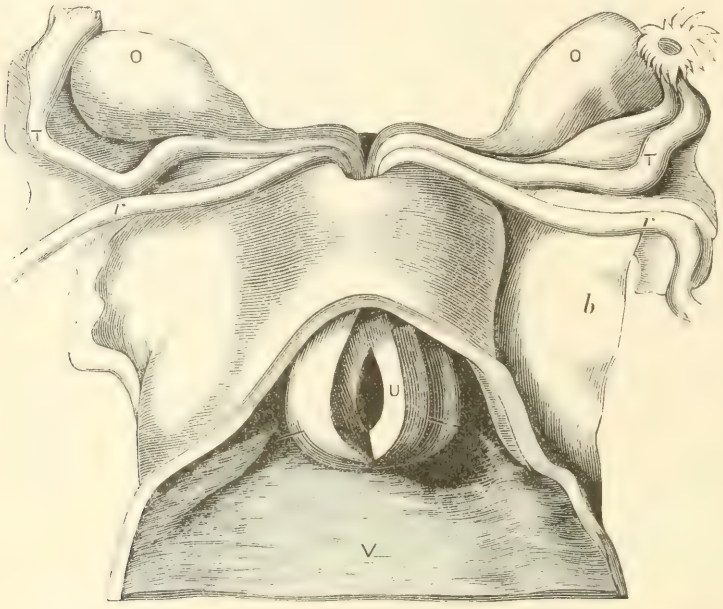
Pathological Anatomy.—The changes which take place in the inverted womb depend upon its duration, the degree of inversion and constriction, and the cause. The tendency to hemorrhage increases with the amount of constriction. Œdema and swelling are present to a greater or less extent. The mucous membrane is usually reddened, and may be ecchymotic in spots. Sometimes it is dry and rugged. Gangrene may result. Spontaneous amputation has occurred, and the entire inverted portion has sloughed off. Erosions, vegetations, and ulcerations are quite commonly present in cases of long standing. Sometimes adhesions take place between the inverted organ and vaginal walls, and between the adjacent surfaces of the inverted peritoneum, though usually such adhesions are not very firm or extensive. The tubes (Fig. 209), round ligaments, and broad ligaments, together with the ovaries, and sometimes loops of intestine, may be drawn into the pocket of the inversion. All the intra-abdominal appendages appear to spring from the peritoneal pocket, and those parts which are not drawn into it are usually swollen and congested. The size[1] of the excavation depends on that of the uterus before inversion. It is much larger when occurring after labor than when it is the consequence of pathological growths or has occurred in a chronic manner. In the latter forms only a part of the oviducts are drawn into the inverted cavity, but not the ovaries or fimbriæ. When succeeding labor and persisting for some time, the process of involution is not arrested. As it progresses the excavation diminishes and the ovaries and oviducts may resume their normal position. Usually, the inverted organ remains within the vagina, but occasionally it protrudes externally and hangs between the thighs. In puerperal inversion the process of involution is much slower than after normal parturition, consequently the size of the inverted uterus will vary greatly according to the duration of the

[1] Klob: *Pathological Anatomy of the Female Sexual Organs.*

interval from the time of the accident. Sometimes months elapse before it resumes its normal size.

The pear-shaped tumor of inversion presents its larger part below, and its small extremity at the level of the vaginal connection. The proximal end is roundish and without an orifice. When the inverted

FIG. 209.



Inversion of Uterus (Crosse): The inverted uterus (*U*) lying in the vagina (*V*) is cut open to show the peritoneal sac, which does not contain the ovaries (*O*); bristles are passed into uterine orifices of tubes. The opening from the abdomen into the peritoneal pouch is indicated by the convergence and descent in it of the Fallopian tubes and round ligaments. The ovaries are nearer to each other than in the normal state, and are seen above the tubes. The view is anterior, and the cervix is concealed by the peritoneum and parts beneath it (after Hart and Barbour).

organ is extruded beyond the surface the epithelium of the mucous surface is transformed into pavement epithelium similar to that of the vagina.

MODES OF INVERSION.—The modes of inversion may, for convenience, be described as fundal, lateral, cervical, and spontaneous. The fundal implies primary depression or dimpling at the top of the uterus. This may begin in the middle or at either horn, followed by the other horn and then by the body. The lateral begins with introversion of a part of either the anterior or posterior wall, usually at the placental site. In either mode the primary depression is the result of localized paralysis, traction upon the internal surface, or violence from without. The inverted portion is seized by the surrounding contracting segment of the uterus and forced downward into the cavity and through the

os tincæ. If the expulsive efforts excited by the indented part fail in driving it through the external os, partial inversion will result.

Fundal and lateral inversion take place by the process of invagination: the cervical by the process of eversion, beginning at the os externum. This mechanism of the displacement is not generally accepted, but the arguments and citation of cases by Puzos, Taylor, Thomas, Reeve, Tyler Smith, and others seem to establish the fact beyond dispute. Reeve describes the process as beginning with "pouting of the cervix, then its eversion, with rolling out of the body and afterward of the fundus." "Preparatory to it (Reeve) the walls of the uterus have undergone a pathological change; the organ is soft and flabby." The case reported by Taylor not only demonstrates the theory of cervical inversion, but proves that it may occur in a nulliparous womb. "The patient had always had excellent health; menstruated at thirteen; has been regular ever since; never had any discharge from vagina or uterus; never had any sexual intercourse;" and "the hymen was intact."

Spontaneous inversion[1] occurs in those cases "in which the womb, without cause, provocation, or premonition, turns itself inside out, all at once, some days, weeks, or months after delivery, on going to stool, straining, laughing, crying, singing, walking, or other kind of exertion or no exertion at all." Lee enumerates 23 such cases in his collection of 142 cases of inversion of the womb. It is not believed that the womb has the power to commence the displacement, or even to cause a depression; but when from some cause a part has been indented, such introcident portion is grasped and propelled downward by successive uterine contractions, whilst the os and cervix become dilated. Crosse and Lee believe that intra-abdominal pressure is the predominant factor in the causation of this mode of inversion. Duncan[2] describes a "spontaneous active uterine inversion" in which a portion of the fundus, most probably the placental site, is paralyzed, and, in consequence of the "state of the retentive power of the abdomen or positive bearing down," such part is forced into the uterine cavity. This inverted part is "seized by the adjacent contracting segments of the uterus, is pushed down, and expelled through the os or even beyond the vagina."

The occurrence of spontaneous inversion is not confined to the puerperal or to the parous womb. Tyler Smith[3] asserts that the "nulliparous organ has been known to invert itself as the result of spasmodic action in long-continued menorrhagia or as the result of a small polypus or fibrous tumor in the cavity of the uterus or upon its peritoneal

[1] Lee: *Amer. Journ. Med. Sci.*, vol. xl. p. 344. [2] *Researches in Obstetrics*, p. 397.

[3] From Duncan: *Researches in Obstetrics*, p. 383; also in *Annals of Obstetrics*, pp. 480, 489.

surface." West,[1] who denies the possibility of inversion "in the natural condition of an unimpregnated woman," admits that the "accident sometimes takes place spontaneously." Puzos in 1744 asserted that he had seen the accident "in women who had never borne children." Boyer (from Thomas) cites an example in a female whose uterus contained no foreign body. Baudelocque saw a case in a girl fifteen years of age who had had a sanguineous flow for about two years, in whom the hymen was perfect. The case of Taylor, before referred to, is even more conclusive. "After all," says Thomas, "there is nothing more astounding in the fact of spontaneous inversion of an undistended uterus than there is in the spontaneous reposition of one which has been long inverted; and this we have, with the positive testimony of scientific and reliable men now on record, no possible justification for doubting."

Inversion most often begins at the placental site. Adhesion of the placenta, traction on or shortening and coiling of the cord, are admitted causes of inversion. Lee[2] studied his collection of 142 cases with special reference to the determination of the relative frequency of these factors in the causation of this accident. In 40 of the cases the data supplied by the reports were insufficient. The following analysis will therefore only refer to the remaining 102 cases: In 39 of these it is expressly stated that the inversion occurred from pulling on the cord, and in 7 from attempts to deliver the placenta. In 67 cases the placenta was adherent, in 31 of which it was detached after inversion. In 10 cases the cord was very short, and in several was twisted round the neck. In some cases the labor was precipitate, and the adherent placenta and inverted uterus simultaneously accompanied the expulsion of the child. In 79 cases there was present one or more of the conditions of adherent placenta, traction on the cord, or attempt to deliver the after-birth. These data point unmistakably to the placental site as the most common locality of primary introversion, and show that violence from within, either direct or indirect, was inflicted at that part. In 14 per centum of the cases the delivery of the placenta was spontaneous. There was neither manual nor artificial interference. The violence was physiological. It cannot be proven that puerperal inversion always begins at the seat of placental insertion, but the accepted belief, derived from observation, is that the initial depression occurs at that point in many cases, independent of any extraneous injury or force. If this be true, it must follow that the primary depression must be due to the structural condition of the muscular wall at that part, and that introversion is effected by morbid or irregular activity of the adjacent segment of the uterine structure, or

[1] *Diseases of Women*, 3d Eng. ed., p. 223.

[2] See also Crampton's collection of cases, *loc. cit.*

by the partial or complete inactivity of the organ. One part is weakened in action, whilst other and surrounding parts are in a highly excited condition. Duncan,[1] who has studied this subject more carefully than any author known to the writer, asserts that "the only condition essential to the production of puerperal eversion is paralysis or inertia or complete inaction," and that inversion cannot begin unless there is paralysis of the whole or a part of the uterus. It has furthermore been shown[2] that the fibres of the portion of the uterus where the placenta is found inserted increase less in volume than the rest, and undergo more considerable modifications of their structure." Rokitansky[3] describes the introversion of the placental site as a disease of the uterus after parturition. He says: "It is paralysis of the placental portion of the uterus occurring at the same time that the surrounding parts go through the ordinary processes of reduction. It induces a very peculiar appearance. The part which gave attachment to the placenta is forced into the cavity of the uterus by the contraction of the surrounding tissue, so as to project in the shape of a conical tumor, and a slight indentation is noticed at the corresponding point of the external uterine surface." He has observed this condition after abortion and after labor at full term. The placental portion becomes a uterine content, and is seized by the adjacent normal structures just as any tumor is in cases of inversion connected therewith. It thus appears that all the conditions necessary may be present for the inception and completion of an inversion independent of any artificial violence or improper care; nevertheless, it is entirely consistent with such a demonstration that the conditions of placental adhesion, shortening and coiling of the funis, and unskilful and unsuccessful detachment of the placenta should constitute very effective agencies in promoting, if not in directly producing, the displacement. Klob[4] asserts that inversion taking place immediately after delivery is either in consequence of precipitate labor or of the shortening or twisting of the umbilical cord, and probably also from incautious traction on it when the placenta is firmly adherent.

It is not improbable that the condition, as well as the position, of the placenta may promote introversion. It is quite reasonable to suppose that a large and heavy placenta firmly attached to a thinned and lax wall might drag inward the area of its attachment when the intra-uterine pressure has been removed by delivery, especially when the labor had been precipitate; and it is equally rational to conclude that placentitis and fibrous degeneration of the elements of union between it and the wall might produce such changes in the wall as would favor its depression.

[1] *Researches in Obstetrics*, p. 374 et seq.
[2] Dubois and Puzos, from Duncan.
[3] *Pathological Anatomy*, vol. ii. p. 229, Swaines' translation.
[4] *Pathological Anatomy of Female Sexual Organs.*

The foregoing considerations should admonish the accoucheur of the imminent danger of hasty and indiscreet interference during the third stage of labor, and of the importance of a careful examination of the uterine tumor in all cases in which the conditions referred to are present, before pronouncing the patient safe enough to permit his absence.

Etiology.—The causes are predisposing and exciting. The predisposing are—feeble and relaxed constitution; congenital defect of muscular contractility; parturition, at term or premature; primiparity; distension of the uterus, physiological and pathological; relaxation of the uterus; injury inflicted by frequent and rapidly recurring pregnancies and violence during previous or present pregnancy; uncontrollable vomiting; disturbance of the retentive power of the abdomen; large pelvis; erect posture during labor; irregular (Crampton) nervous excitement during pregnancy and labor; and "development[1] (Klob) of the larger follicles in the vaginal portion, in consequence of which the external orifice is dilated and the relaxed lips of the os uteri are gradually everted;" and laceration of the os.

Parturition, primiparity, and distension are the predominant influences. The occurrence of the accident after abortion or miscarriage has not been very frequent, and is usually associated with some direct agency. In Woodson's case[2] it occurred at the fourth month, in consequence of unusual effort and forcible extraction of the fœtus by the patient herself; in Skae's case,[3] during the fourth month, caused by severe and continued vomiting; in Weist's, by previous hemorrhage at fourth month; in Sweeney's, at fourth month, by forcible removal of portion of the placenta; and in the cases of Brady and Warren, during the fifth and sixth months. In the latter case there was twin pregnancy, and the accident was attributed to a fall down steps. Other cases have occurred from similar causes at later periods of gestation.

The causal influence of primiparity is very clearly established by Crampton's statistics. In 176 cases in which the number of births is stated, 88 were first deliveries. No one has offered a satisfactory explanation. It must, therefore, for the present, be relegated to the general law of greater liability to casualties among the primiparæ.

Physiological distension occurs during pregnancy. Pathological dilatation may be induced by retained secretion, accumulations of fluids, and morbid growths. Klob considers inversion only very rarely possible after sudden evacuation of accumulated fluids, and then only in slight degrees. Distension produced by morbid growths is very gradual. In such cases inversion is most frequently the result of attempts at removal of the tumor, but spontaneous expulsion and inversion have occurred

[1] *Loc. cit.*

[2] *Amer. Journ. Med. Sci.*, vol. xl. p. 410..

[3] Crampton: *loc. cit.*

quite often. The usual history of such cases is menorrhagia or metrorrhagia for an indefinite period, then pain like labor-pains, attended with hemorrhage, and expulsion of the tumor. In many of the cases uterine contraction is excited by the presence of the foreign body; in other instances it has been induced by artificial dilatation of the cervical canal. Johnston[1] reports a case of inversion caused by the spontaneous expulsion of a tumor weighing two and a half pounds. The morbid growth may be either sessile or pedunculate, and, except in very rare instances, is attached at the fundus. Klob refers to a case of "inversion of the posterior wall of the uterus caused by a fibrous polypus which was attached in the vicinity of the internal os."

Exciting Causes.—Aveling[2] has divided the determining causes into automatic, systemic, and mechanical. Automatic inversion is caused by muscular contraction of the uterus, and is always of the fundal variety. Systemic inversion is usually the cervical, and is caused by contraction of the abdominal muscles or by a combination of the action of the abdominal and respiratory muscles. Mechanical inversion may be either propulsive or extractive, or both. Propulsion may be induced by blows on the abdomen, falls, accumulations of gas in the intestines, sudden and violent contraction of the abdominal parietes, and pressure of the superincumbent abdominal viscera. The extractive influences may be either manual or gravitatory. They refer especially to the considerations already set forth (see p. 698) relating to the frequency of the seat of placental insertion as the locality of primary depression. Similar forces are in operation when inversion occurs from traction on intra-uterine tumors or when the expulsion takes place spontaneously.

It may be stated, in the concise expression of Duncan, that "some part of the uterus must be in a position to be seized by the remainder." This condition may be consequent upon paralysis of the placental site, partial or total inertia, irregular contractions, after-pains, atony from distension or resulting from protracted or precipitate labor, or pregnancy at long intervals; inertia with traction on the cord; coiled, twisted, knotted, or short funis; large, heavy, or adherent placenta; unskilful and unsuccessful attempts at delivery of placenta; abortion; miscarriage; and traumatism.

Symptomatology.—It is a singular fact, but nevertheless true, that inversion of the uterus has occurred and existed for a long time without giving rise to any "symptoms to attract (Reeve) attention or to indicate that anything has gone wrong." In such cases the size of the inverted organ is so diminished by contraction and involution that it forms an inconsiderable tumor, causing no inconvenience.

[1] "Trans. Washington Obst. and Gynecol. Soc.," *Am. Journ. Obst.*, vol. xx. p. 961.

[2] *On Inversion of the Uterus*, p. 14.

A brief résumé of the symptoms of acute puerperal inversion is a necessary prelude to the discussion of the symptomatology of the chronic forms. When occurring suddenly, as it usually does, either during the third stage of labor or simultaneously with its completion, it is characterized by profound shock, marked by increasing exhaustion, pallor, coldness, and feebleness of the pulse, with profuse hemorrhage, and pain varying in intensity from maximum severity to a greater or less pelvic distress. There is a sense of fulness in the vagina or consciousness of something having escaped from the vulva. A physical examination discovers a soft, spongy, bleeding tumorous mass either in the vagina or extruding from the vulva, to which the placenta may or may not be attached. There is absence of a hypogastric tumor. If time permits and the thickness of the abdominal walls does not preclude its possibility, a cup-shaped excavation may be discovered by palpation behind the symphysis pubis, larger or smaller according to the interval of time between the completion of labor and its occurrence. In cases of partial inversion the subjective symptoms are not so marked or characteristic, and the physical signs are recognized with much greater difficulty; consequently, the accident in its initial stage very frequently escapes observation. The process of development progresses to complete inversion, and a shorter or longer period of invalidism elapses before the diagnosis is made. This delay is not so much due to the difficulty of making a diagnosis as to the failure of the attending physician to make a careful vaginal exploration. Metrorrhagia, dyspareunia, physical debility, leucorrhœa, discomfort in walking, standing, or sitting; more or less constant pelvic distress, sometimes with acute pain; a sense of vaginal fulness; dragging-down sensations about the pelvis, lower part of the abdomen, and back; vesical irritability, with or without tenesmus and dysuria, together with anæmia and a general constitutional condition indicative of continuous suffering,—constitute the ordinary subjective history of such cases.

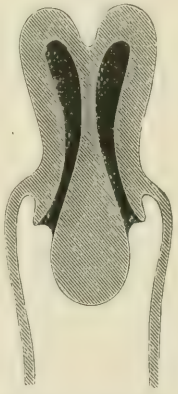
Objective Symptoms.—The physical signs of chronic inversion are so similar to those of polypus that great care is necessary to differentiate the one from the other. The finger introduced into the vagina comes in contact with a pyriform tumor of variable size (Fig. 212) and firmness, with its small extremity above, surrounded by a firm ring. Around this ring the finger will sweep, but at no point can the finger or a probe be forced into the os or an opening. By recto-abdominal palpation and vesico-rectal manipulation the absence of the uterus from its proper position may be made out, and by abdominal palpation the cup-shaped entrance of the inverted cavity may be discovered. An examination with the speculum will disclose its color, mucous surface, and perhaps the orifices of the Fallopian tubes. Acupuncture will give pain.

Browne suggests that incision made into the tumor will determine the existence of the inverted cavity and positively exclude a solid tumor. Sometimes the diagnosis will be facilitated by drawing the tumor out of the vagina.

If the tumor be a polypus, a careful examination will discover the uterus (Fig. 211) *in situ*. The finger or a probe may be forced through the os. Acupuncture of the tumor will not give pain. If, as occurs in very rare instances, the os should be obliterated by adhesions (see Fig. 213), the presence of the uterus *in situ* must constitute the chief resource until an entrance can be made through the os into its cavity.

Partial inversion can be differentiated from polypus by discovery of the depression on the surface of the uterus, the diminution of its cavity, the circumstances of its occurrence, duration of invalidism, and pain from acupuncture.

FIG. 210.



Uterine Polypus *plus* partial inversion (after Hart and Barbour).

Partial inversion, as shown in Fig. 210, produced by the dragging of a polypus on the internal surface of the uterus, is not so easily diagnosticated. A careful bimanual examination, made with a finger in the rectum, may detect the cup-shaped depression of the partial inversion, and the cavity of the womb is always enlarged by the presence of a polypus. If possible, a digital exploration of the cavity may also be of great assistance in detecting the presence of the tumor occupying the cavity of the womb.

In ordinary cases there is but little difficulty in making a diagnosis between chronic inversion and polypus. The introduction of a sound (Aveling) to the fundus will show the direction and depth of the cavity and position of the uterus (see Fig. 211); and the absence of the uterus from its normal position (see Fig. 212) may be proven by the contact of a finger in the rectum and a sound in the bladder. In cases of retroflexion of the uterus the retroflexion will be felt by the finger in the rectum, and may be mistaken for a polypus. In such cases the probe must be passed into the retroflexion; then, with a finger in the rectum, the position and mobility of the retroflexed body and fundus will be easily ascertained.

In occasional cases the polypus grows from or is attached mainly to the entire circumference of the os (see Fig. 213), and the diagnosis can only be made by the history of the case, the presence of the uterus *in situ*, the discovery of or the making of an opening through which the cavity can be measured, and the absence of the opening of the Fallopian tubes on the sides of the tumor.

When an inverted uterus protrudes from the vagina it may be mis-

taken for a prolapsus. In prolapsus the upper is the larger extremity; in inversion the lower is the larger. In inversion there is no orifice at the most dependent part; in prolapsus the os is readily found. In

FIG. 211.

FIG. 212.

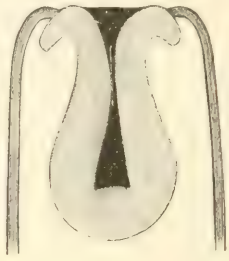


FIG. 213.

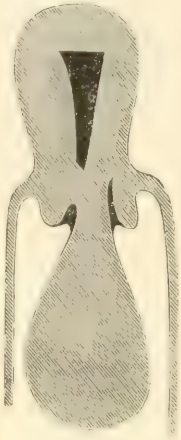


FIG. 211.—Uterine Polypus (after Thomas). The uterus in its normal position; sound passes into uterine cavity.

FIG. 212.—Inversion of Uterus (after Thomas). A cup-shaped depression is in the place of the uterus; sound arrested at the angle of flexion.

FIG. 213.—Uterine Polypus. Adhesion and pedicle obliterate cervical canal (after Hart and Barbour).

inversion a catheter will pass up behind the symphysis pubis into the bladder; in prolapsus it will turn downward into the cystocele, caused by the dragging of the bladder down with the procident womb. A rectocele is easily distinguished by a finger in the rectum; a cystocele, by the sound in the bladder.

In chronic inversion, whether partial or total, the uterus (Crosse) is subject to descent and prolapse, followed by all the complications, inconveniences, and dangers attendant on similar displacements of the uninverted organ. When of long standing prolapse occurs in a large proportion of the cases. When prolapsus takes place the vagina is necessarily inverted and may be dragged down externally, forming a hollow tube lined with the peritoneum; the bladder and rectum may also be brought down, and the vaginal pouch may be occupied by the intestines. In such cases the menstrual flow may take place from the inverted uterine surface. If the prolapse continues after the cessation of menstruation, the exposed mucous membrane assumes the appearance of the skin. In all such cases (Crosse) the patient is a loathsome, miserable object, walking with knees apart, suffering pain and discomfort from ulceration, inflammation, and even spacelation, the result of urinary incontinence, which is always present in such cases.

Course, Progress, and Termination.—Persistence of the displacement until it is reduced is the rule. There are, however, some very remarkable exceptions. Spontaneous reduction has taken place in cases reported by Meigs, Spiegelberg, Leroux, De la Barre, Thatcher, Rendu, Shaw, Baudelocque, Fonjen, and Huckin, in all twelve in number.

Inversion may exist without the knowledge of the patient, but the usual course is one of continuous and increasing suffering until it is reduced. In occasional cases the subjective conditions abate with the progress of the process of involution. When it is completed, months after the occurrence of the accident, recovery of the general health may follow.

Duration does not constitute an obstacle to successful treatment. Tate succeeded in a case of forty-two years' duration. In this case the inversion occurred simultaneously with the completion of labor, and at the time of treatment was associated with vesicocele and rectocele. It was reduced by the method of Courty, with pressure through the bladder.

Prognosis.—Crampton rates the general mortality at 20 per centum. Some die from shock or hemorrhage; some, from exhaustion after long-continued suffering and recurring hemorrhages. Some cases are sooner or later complicated with fatal cellulitis or peritonitis. The mortality of acute inversion is larger than of the chronic. Of Crampton's collection of cases, 32 of the 120 recent cases died; of the 104 chronic cases, 7 died. Crosse fixes the mortality of the acute form at one-third.

The dangers are not limited to the nature of the displacement and circumstance of its occurrence. Errors of diagnosis and methods of treatment, as well as unskilful execution, have contributed largely to the mortality. Many inverted uteri mistaken for polypi have been amputated. Ablation has added its quota, and rude and crude attempts at reposition have not been free from fatal complications.

So often have mistakes in diagnosis led to disastrous results that one feels mortified at the carelessness and ignorance with which physicians have approached such a grave disorder. But mistakes resulting in death have not been confined either to the ignorant or careless. Some of the most renowned of the profession have committed, seemingly, inexcusable blunders in diagnosis. At the present time, with the improved methods of examination and advances in scientific knowledge, similar mistakes would be criminal.

Treatment.—The expectant plan of treatment consists in permitting the displacement to remain, and attempts by local applications and general medication to modify and alleviate the subjective symptoms. It is purely symptomatic. In the present state of scientific

medicine it is wholly inexcusable. Human nature is oftentimes very tolerant of useless and perhaps injurious methods of medical treatment. With a knowledge of the fact that duration is not an obstacle to successful reposition, as shown by the success of J. H. Tate in a case of forty-two years' standing, it is incredible that any physician would follow the expectant plan any longer than was necessary to prepare for some more scientific and successful procedure. If, however, methods of reduction have failed after proper and skilful efforts, and the issue of expectancy or ablation arises in patients approaching the menopause, when menstruation will soon cease and atrophy begin, it may not be injudicious to attempt by the local application of hæmostatics to arrest the bleeding and promote atrophy. Aran claims to have succeeded in arresting the hemorrhage and reducing the tumor by dragging down the inverted organ, so as to expose its entire surface, and freely applying the actual cautery, potassa cum calce, or one of the caustic mineral acids, then washing "with a neutralizing fluid, and enveloping it in lint before replacement in the pelvis." Thomas suggests in this connection that any method which will transform the investing mucous membrane into a skin-like integument, as nature has done in several cases of long standing, commands thoughtful consideration.

Ablation.—Ablation is performed by incision, ligation, écrasement, and cauterization. In the earlier times it was the most common method of treatment. Now it is rarely resorted to, and only as a *dernier ressort*. So many conservative and safer procedures have been devised, mostly by Americans, during the present century, that amputation would only be considered in exceptional cases after absolute failure of taxis and other cutting operations. The mortality from ablation is about 30 per centum.

The objections to the operation of ablation are the possibility of removing a part of the intestine, which may be enclosed in the inverted cavity, profuse and fatal hemorrhage, the production of artificial emansio-mensium, and resulting sterility.

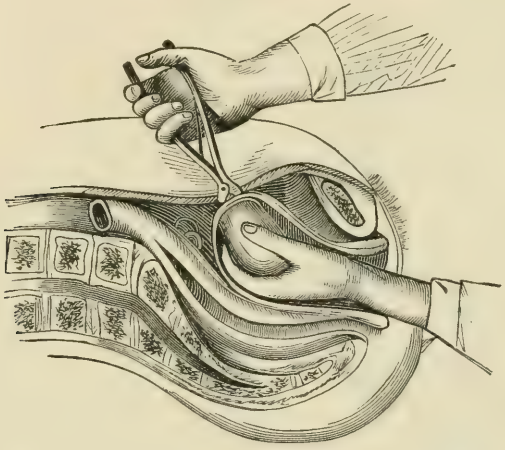
Ligation alone, and amputation either with the scissors or knife, are more dangerous than the other methods of ablation. Incision and the écraseur, preceded by the ligature, are usually attended with profuse and alarming hemorrhage. McClintock devised the method of obliteration of the vessels by ligation several days before the operation. The galvano-cautery has not obviated the dangers of the operation of ablation. Courty[1] insists that the elastic ligature "is a method which presents more advantages and fewer dangers than any other." He employs the elastic ligature by means of an india-rubber tube, tightened moderately the first day, and more every succeeding day till the tumor falls; which it generally does from the twelfth to the eighteenth

[1] *The Uterus, Ovaries, and Fallopian Tubes*, p. 459.

day. Previous to its application a groove should be made by the thermo-cautery, in which the ligature will rest. Hegar and Kaltenbach pass a ligature through the neck, high up, which constricts the vessels and closes the peritoneal cavity, and then remove the body. In all these methods of ablation strict antiseptic precautions should be adopted and the pain should be relieved by the use of morphia.

Other Cutting Procedures.—Thomas' "method consists in abdominal section over the cervical ring, dilatation with a steel instrument made

FIG. 214.



Replacement of Uterus by Dilatation through Abdomen.

like a glove-stretcher, and reposition of the inverted uterus by some one of the methods" hereafter described. The operation is certainly safer than, and preferable to, amputation.

Browne[1] describes his operation as follows: "The inverted fundus is drawn outside of the vulva with a strong volsella forceps, until the openings of the Fallopian tubes are plainly in view; then an incision one and a half inches in length is made through the posterior portion of the uterus (avoiding the tubes and larger vessels at the sides). Through this incision Sims' large dilator is passed up into the cervix, and expanded to the fullest extent until the tissues of the cervix are felt to relax; then withdrawing it and passing through the cervix Nos. 2 and 3 of Hank's hard-rubber dilators. The incision is then sutured, and the inversion is reduced by manipulation."

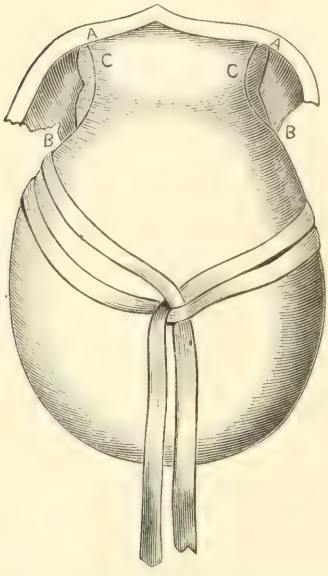
Each of these operations is applicable to a similar class of cases. Neither is suggested as a substitute for more conservative methods, but as a safer procedure than ablation and as an alternative when taxis fails. Their comparative advantages must depend upon the relative danger of an incision through the abdominal and uterine walls. It

[1] *New York Med. Journ.*, Nov. 24, 1883.

seems to the writer that a laparotomy is less hazardous than a sutured incision of the wall of an inverted uterus, which may be reopened during the reduction (which must follow immediately), and remain concealed from inspection in the abdominal cavity. Neither of them has been performed sufficiently often to determine its value.

Barnes' Method.—Having failed in attempting to reduce an inversion by Tyler Smith's method, Barnes succeeded by drawing down the inverted organ to the vulva by a slip-knot of tape: he made three incisions across the fibres of the cervical sphincter, and then, by compressing the uterus with one hand and maintaining counter-pressure over the abdomen with the other, the inversion was speedily reduced. He does not, however, advise this method until other more conservative procedures have failed.

FIG. 215.



Inverted Uterus drawn down by a tape-noose: *A*, *C*, *B*, line of incision in cervix in Barnes' operation (Barnes).

Methods of Reposition. — Previous to the year 1858 few cases of chronic inversion of the uterus had been successfully reduced. Those few had been accomplished by taxis. They were regarded, however, as illustrations of accidental dexterity rather than proof of any well-devised system which might be applicable to all cases without regard to the duration of the displacement, or one that would supplant the mutilating operation which had been previously so frequently resorted to. During the year 1858 the late Prof. James P. White of Buffalo, N. Y., and Tyler Smith of London published the successful result, with the description of their methods, of uniform and sustained pressure. Since then many modified and auxiliary procedures have been devised and successfully applied. The methods of White[1] and Smith[2] were essentially different, though alike in that they secured uniform, elastic, and sustained pressure. Priority undoubtedly belongs to our distinguished countryman. The result of these and other allied modes has been so satisfactory that the prediction of White in 1858 is realized in the assertion of Aveling in 1887, that "every case of inversion can be cured by reposition."

Before proceeding to execute any method of reposition it is

[1] First case, February, 1856; second case, March 12, 1858.

[2] First case, April 24, 1858.

deemed advisable by some operators to employ preparatory treatment, such as posture, hot and cold vaginal douches;[1] belladonna, either in the form of vaginal injections, application of the ointment to the neck of the uterus, or rectal suppositories; compression and dilatation of the cervical ring; incisions on the surface of the inverted organ; and division of the cervix by introducing a bistoury through the inverted fundus. It is satisfactory, says Aveling, to know that "all these aids to reposition concern us only as of historical interest," and are no longer necessary or expedient.

Methods by Repositors.—Previous to the discovery of White—which was, in fact, in 1856—several methods of reposition had been devised and practised with only very rare and uncertain success.[2] Simple manual compression, with continuous pressure, associated with attempts to indent the fundus—which was, perhaps, the oldest plan—proved impracticable, because of the impossibility of maintaining the compression sufficiently long to accomplish any result beyond actual injury. Viardel in 1674 published a description of his rod (Aveling) with rounded ends. Subsequently, Chailley Honori bent the rod to conform to the pelvic curve. Madame Boivin suggested rods with cupped ends. Later, Barnes and Braxton Hicks modified the repositor of Von Siebold, which consisted of a curved stem surmounted with a sponge. Hicks covers the end with india rubber, and Barnes attaches a hollow rubber cup to a curved stem. These are retained in position by a T bandage. The progress of discovery advanced from a straight to a curved stem, and from the round to the cup-shaped end of the rod. In this advance three important principles were developed and verified: First, that the force must be in the direction of the pelvic curve; second, that reposition began at the cervical ring, as described by White, by dilatation and reflection of the os over the neck and body consecutively (the fundus is not dimpled at the centre or either horn, and is not reflected upon itself); third, that uniform, elastic, and sustained pressure upon the fundus in the line of the pelvic curve produces dilatation of the os, followed by its reflection over the cervix, and by gradual expansion of the cervix and body as they roll back through the os until the fundus is replaced in its normal position. In other words, the process of inversion is reversed, and reposition begins where inversion terminated.

Smith's Method.—This method is a combination of elastic pressure and manipulation. The uterus is kneaded twice daily with the hand passed into the vagina, and during the intervals elastic pres-

[1] Martin of France succeeded in a single case by throwing a stream of cold water upon the fundus.

[2] Five cases cited by Thomas: *Diseases of Women*, 5th ed., pp. 463, 467; also, Emmet, p. 415, 1st ed.

sure is maintained by an air-pessary retained in the vagina by a T bandage.

Teale and Bockenthal succeeded with the air-bag without resorting to uterine massage.

"Thiry has devised (Hart and Barbour) an ingenious bag consisting of a double-walled india-rubber capsule, which is slipped over the uterus; when distended with air it compresses and pushes up the inverted uterus."

Thomas has improved the method of sustained pressure by the use of elastic bags. He fixes the inverted organ in position by firmly tamponing around it "with carbolized cotton soaked in glycerin," and then introduces an india-rubber bag filled with water, which is retained in position by a "strip of adhesive plaster extending from the lumbar region between the thighs and as high up as the navel." The advantage of this device is that the pressure can be increased or diminished without disturbing the adjustment of the apparatus, either by injecting more water into the bag or lessening the quantity by turning the stop-cock in the tube. The use of elastic bags, filled either with air or water, has, however, been superseded by other methods, which are more effective and less cumbersome.

White's Method.—The construction and action of the uterine repositor will be readily understood by reference to the accompanying cut.[1] "The instrument is composed of a stem of wood or hard rubber curved to conform to the vaginal curvature, with a coil of steel wire attached to the outer extremity, whilst the other end is expanded and hollowed so as to receive the fundus of the uterus in its concavity or disk. The edge of this disk is tipped with soft rubber, being an inch and three-eighths in diameter and about half an inch deep. The concave extremity of this instrument is carried up into the vagina and placed in contact with the fundus, and then firmly held by the hand in the vagina. The outer end of the instrument, or the coil of wire, is placed against the breast of the operator on a level with the uterus. By means of this large circular spring the instrument readily keeps its place on the clothing of the operator, and leaves the other hand free to be used above the pubes to assist in fixing the uterus, and assist also in forcing open the dilating os, which can ordinarily be plainly felt through the abdominal walls.

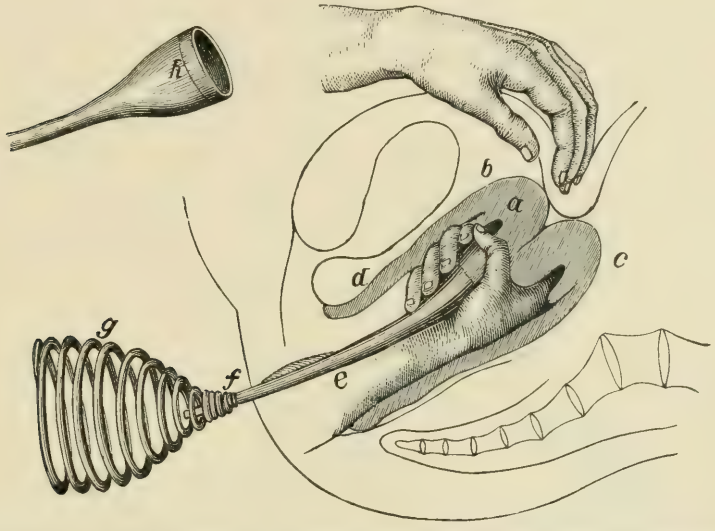
"The spring at the outer end of the instrument enables the operator, without danger of lacerating the tissues, to keep up a constant gentle pressure upon the fundus, and by leaning forward to increase the pressure intermittingly. The force thus exerted is applied more directly upon the fundus by means of the repositor than would be possible if the thumb and fingers were used. . . . .

[1] *Transactions of the International Medical Congress*, Philada., 1876, p. 880.

"The intravaginal hand compresses the body and fundus and lessens its vascularity, whilst something is gained by intermitting the pressure, also lessening by its use the exhaustion incident to intermitting muscular effort of the operator."

The patient should occupy the dorsal position, with the buttocks

FIG. 216.



Rapid Reduction by White's Method. Operator grasps uterus, *a*, and presses his chest against spiral spring, *g*, *f*, which forces cup of repositor against fundus. *b*, "anterior lip or wall of uterus, with the fingers of left hand pressing upon it and assisting in pulling open the uterine cavity; *c*, posterior uterine wall semi-reflected; *a*, anterior vaginal wall; *e*, wooden or hard-rubber stem of repositor, its enlarged extremity held in contact with the fundus by the intra-vaginal hand of operator; *f*, distal extremity of stem made into a screw, so as to be fastened into *g*, a coil of No. 11 steel spring wire, requiring eight or ten pounds pressure by the breast of the operator, against which it is placed, to bring it down;" *h*, uterine extremity of stem *e*, which is terminated with a soft-rubber disk 1¾ inches diameter, the concavity into which the fundus is received being about one-half inch deep, with its terminal margin thin and soft (after White).

drawn to the edge of the bed and each leg securely held by assistants. The operator should occupy a position between the extremities of the patient. Anæsthesia should be pushed to complete insensibility.

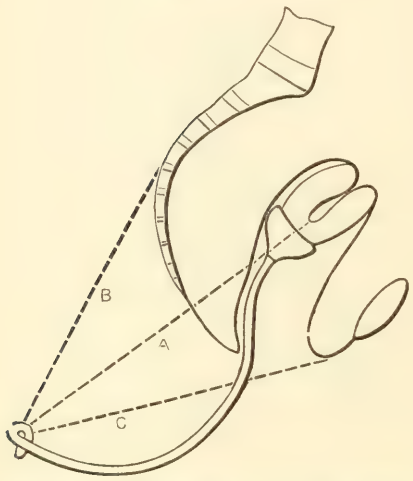
Aveling's Method.—The sigmoid-cupped repositor devised by Aveling is based upon the theory that axis-pushing "in the direction of the upper axis of the pelvis" is superior to any other method in "ease of performance,[1] painlessness, safety, rapidity, or unfailing action." Reduction takes place, as with White's repositor, by the cervical method.

The size of the cup should be, in diameter, slightly less than that of the fundus. To adjust the apparatus a belt should be applied round

[1] It is due, however, to Dr. Aveling to state that he expressly excludes the cases treated by White's method, which he characterizes as "a combination of taxis and violent pressure by means of a ten-pound spring against the chest."

the waist and fastened to braces over the shoulders by safety-pins. "This should be done in such a way as to leave room to pass the tapes, to which the rings are attached, between the pin of the safety-pin and the belt. Now the cup of the repositor should be applied to the fundus uteri, and held firmly in position by an assistant while the rings are adjusted, two being taken in front and two behind. The ends of the tapes should next be passed between the safety-pins and the belt, points of the tapes drawn through, and a knot made at the ends to prevent them slipping back." Tension to a greater or less degree can be secured either by tightening or loosening the tapes. Tension must be equally distributed, and the parts must be protected from the pressure of the elastic bands or tapes. The patient must be confined to the bed, and, if necessary, morphia must be given and the bladder evacuated by the catheter.

FIG. 217.



The Sigmoid Repositor applied: *A*, line of pressure; *B* and *C*, traction lines of elastic bands (after Aveling).

Aveling states that in eleven successful cases the pain was not excessive in a single case, and in only one were there any unpleasant after-consequences. The time required for reduction averaged about forty hours, the longest being fifty-four and a half hours, the shortest nine hours. A pressure of two and a half pounds is usually sufficient to effect reduction. The repositor should not be removed too soon, and when removed a sound should be passed to ascertain whether the fundus is completely restored. He subsequently reports an unsuccessful case.

The principle of action in the methods of White and Aveling is identical, but the manner of evolving the force is essentially different. In one the elastic pressure is derived from a steel spring and directed, through an inflexible rod "curved to conform with the curve of the vagina," against the inverted fundus; in the other the elastic force is derived from elastic bands and exerted upon the fundus through a sigmoid inflexible rod in the direction of the axis of the superior strait of the pelvis. White's is more rapid, more painful, and perhaps more hazardous; Aveling's is certainly less laborious to the operator.

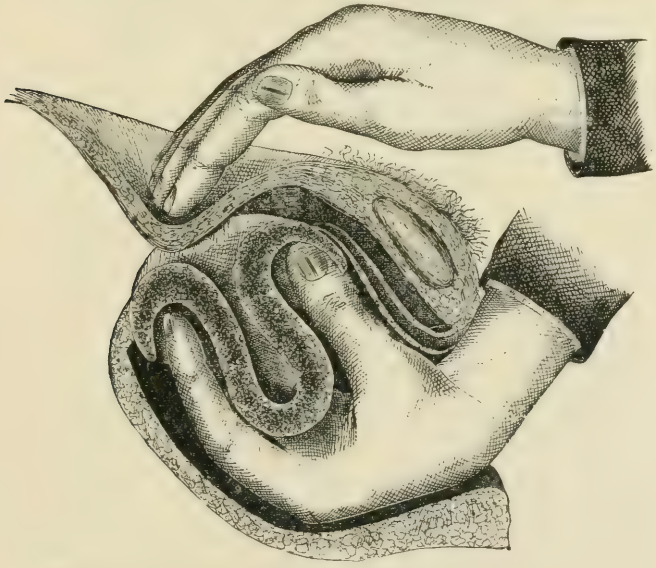
Wing develops elastic pressure by another very ingenious contriv-

ance. He adjusts against the inverted fundus a rubber ring in which is placed a round plug of polished wood. The external end of this plug is fastened at the crossing of two pieces of rubber tubing which pass between the thighs and are attached, two ends in front and two behind, to a belt around the waist. The ring keeps the fundus in place, and the rubber tubing maintains continuous elastic pressure.

Byrne has practised a different method. His instrument consists of a hard-rubber cup, varying in size to fit the fundus, in which a plate is so fixed that it can be propelled by a screw against the fundus. Another cup with a movable cone is adjusted to the abdomen and screwed down into the cervical ring. The plate in the vagina is then slowly propelled against the fundus, whilst counter-pressure is maintained by the cone inserted into the cervical ring.

Methods of Manual Reduction.—Emmet's method consists in encircling with the fingers and thumb that portion of the body close to the seat of inversion, while the fundus rests in the palm of the hand. This portion of the body is "firmly grasped, pushed upward, and the

FIG. 218.

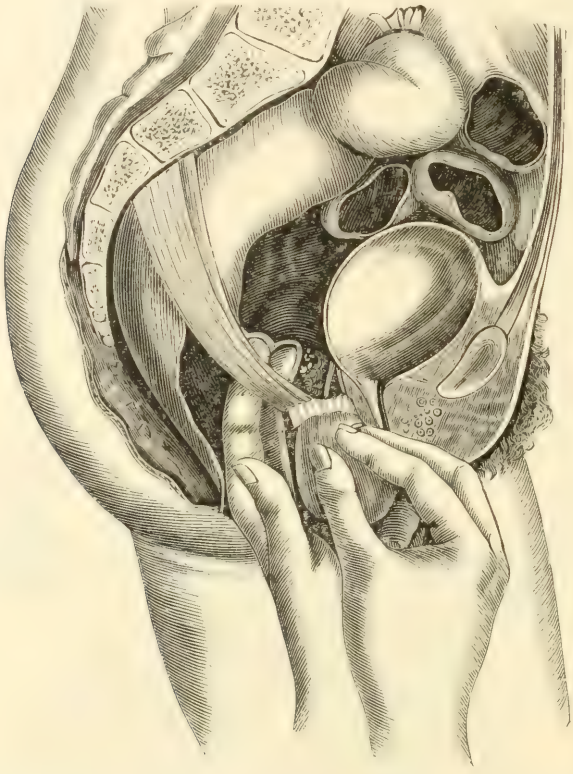


Emmet's Method of Reducing an Inverted Uterus (after Emmet).

fingers then immediately separated to their utmost; at the same time the other hand is employed over the abdomen in an attempt to roll out the parts forming the ring by sliding the abdominal parietes over the edge." This manipulation is repeated and continued. After the body has advanced well within the cervix steady upward pressure upon the fundus is applied by the tips of all the fingers brought together.

Courty's Method.—The cervix is first drawn outside of the vulva with Museux's forceps; then the index and middle fingers of the left hand are introduced into the rectum and pushed upward and forward so as to fix the cervix; then, seizing the uterus with the right hand, it

Fig. 219.



Position of the Hands in Reducing Inversion by Courty's Method. The two fingers of the left hand are curved to retain the cervix; the fingers of the right hand push back the uterus, commencing with the parts which have escaped last. The utero-sacral ligaments are exaggerated, and the bladder has been left in its usual place (after Courty).

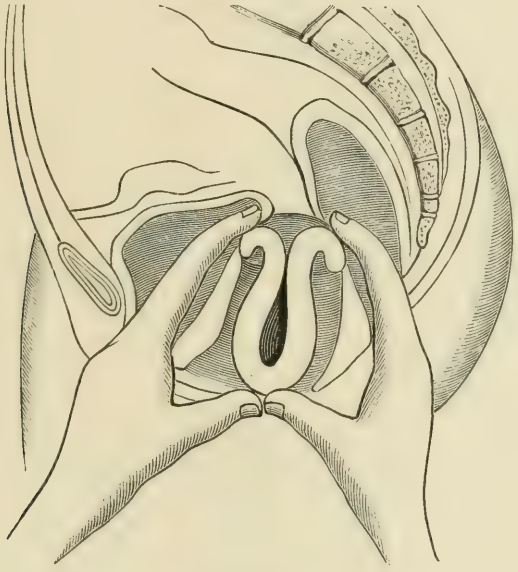
is pushed back into the vagina. With the thumb and index finger of the right hand pressure is made on the pedicle of the tumor, so as gradually to increase the depth of the utero-cervical groove, and thus by uniting taxis on the body with immobilization of the neck reduction is effected without violence.

Noeggerath's Method.—This consists in the effort to invert one or both horns of the inverted organ by making pressure against one horn with the thumb, and against the other with the index finger. When both horns have been inverted, central pressure is made until reduction is accomplished. Counter-pressure is made with the other hand over the cervical ring. This method seems very simple, but should be

practised with great caution, or the fingers might penetrate the uterine structures. Thomas declares it applicable only after reduction of the neck.

Tate's Method.—This is a combination of the methods of Courty and Noeggerath. It is accomplished by fixing the neck by inserting three fingers into the ring, one of one hand introduced through the

FIG. 220.



After Mundé.

urethra, and two of the other hand into the rectum, and making pressure against both horns with the thumbs. Tate succeeded after half an hour's effort in completely reducing an inversion of forty-two years' duration.

Barrier's Method.—He compresses the uterus with the whole hand, and seeks to indent the fundus with the thumbs. Counter-resistance is made by forcing the cervix against the sacrum.

Watt's Method.—He has succeeded by a combination of the methods of Courty and Tate. The uterus was drawn partially out and seized by one hand. Two fingers of the other hand were passed into the rectum, and one of them inserted into the ring. The grasped uterus was then forced upward against the finger in the ring. As soon as the dilatation of the ring would permit, the other finger was inserted, and then by continuing the pressure of the uterus against the fingers reposition followed.

Meissner's Method.—He grasps the uterus with four fingers of each hand, and applies the thumbs to the lowest part of the inverted fundus.

The object is to make a depression at that point, and (Charpentier) to increase it by gradual and moderate pressure.

Valentin in 1847, and Quackenbush in 1855, succeeded, each in one case (Emmet), by dilating the vagina with sponge tents, then seizing the uterus with the fingers and thumb of one hand, made pressure, whilst the other hand grasped the hypogastrium. Etherization was carried to the extent of producing relaxation of the sphincters.

No one of these methods, manual or instrumental, is applicable to every case. The clinical history of the patient, duration and cause of the inversion, and size and condition of the organ should be considered in the selection of the method of reposition. As a rule, the gentlest and least dangerous procedures should be first tried. Nor should any one method be persistently adhered to, to the exclusion of others. The failure of one after a reasonable trial suggests an attempt with some other. It is equally true that no method should be hastily abandoned for the mere purpose of substituting another. No operator should attempt any of the methods, manual or instrumental, which require the presence of assistance or continuous physical effort without the presence of such skilled assistants as could render the necessary aid or take the place of the operator in the event of his exhaustion. It might happen that just at the moment of greatest importance one or both hands might become powerless to complete the reduction, or that general exhaustion from a continuous constrained position or effort might surprise the operator when patience and endurance were most needed.

In those cases where the method employed is manual, or executed by an operator, the patient should occupy the dorsal position, with the buttocks drawn to the edge of the bed and elevated on a cushion. The legs must be held and supported by competent assistants.

When one or more of the gentler methods have failed after a reasonable trial, a more vigorous procedure may be substituted; but it is never prudent to follow one effort or method immediately by another. Sufficient time should elapse to allow the patient to recover from any ill effect and to be assured that no injury has resulted from the previous attempt.

Before making any effort at reduction such preliminary treatment as the exigencies of the case may demand should be employed. The condition of the bowels should be attended to—a free evacuation should be secured daily for several preceding days; the vagina should be syringed daily, or oftener if deemed necessary, with hot water, and it may be prudent to accustom the vagina to the manipulation by the introduction of the hand. The diet should be regulated and every precaution adopted to avoid complication or interruption. No operation should be undertaken during the menstrual period unless the peril of the patient from hemorrhage forbids delay. In all cases when

reduction is possible at a single trial of any method, manual or instrumental, anæsthesia to a greater or less degree, usually to complete insensibility, should be induced. It not only protects the patient from suffering, but it is the most valuable of all aids to any method of reposition.

In those cases where an adjustable apparatus is employed, which is to be retained in position for a period of time, anæsthesia is not necessary; but the patient must be confined to bed and strictly enjoined to avoid every movement likely to disturb the adjustment of the repositor. Examinations should be made daily or oftener to discover any displacement of the apparatus. Such patients should be kept free from pain by the use of morphia. In all cases after reduction, however accomplished, the patient should be confined to bed for a shorter or longer time; the diet should be restricted, and such general regimen should be enforced as may secure immunity from inflammatory or other complications; and if any such result should follow, prompt and appropriate treatment must be employed. Careful examinations should be made at intervals during the convalescence to discover any

FIG. 221.

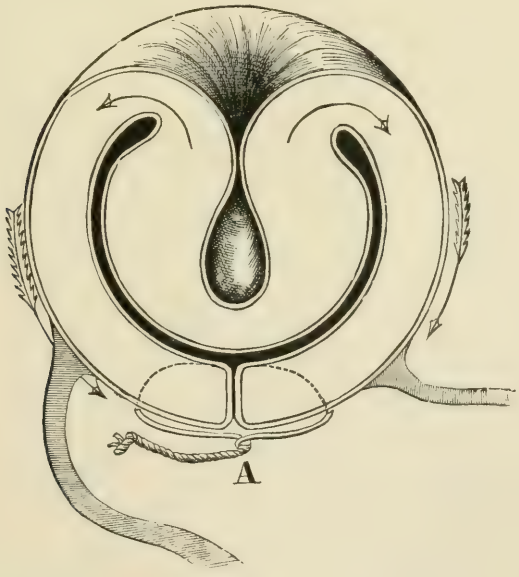


Diagram showing direction of traction exerted by sutures in cervix uteri after partial reduction of inversion (after Emmet).

recurrence of the displacement. Hot water and antiseptic vaginal injections may become necessary—in fact, may be important accessories to the management of the period of convalescence. Ergot may also

contribute to the security of the patient from recurrence. The exercise and employment of the patient should be supervised.

When the inversion has been caused by a polypus or other intra-uterine tumor, such growth must be removed before attempting reposition. In such cases antiseptic after-treatment is more important than in the others. Precautionary measures against more probable dangers should be even more strictly enforced. In such cases the area around the attachment to the internal uterine surface is believed (Scanzoni) to have undergone fatty degeneration or (A. R. Simpson) malignant infiltration.

In those cases where the effort at reduction has to be abandoned before the reposition is accomplished, and in those where there is liability to immediate recurrence, Emmet has devised and practised the procedure of closing the os by drawing the lips together with several interrupted silver sutures. In this manner he has also accomplished complete reposition in cases where by manual effort the fundus has been reduced within the os. The drawing of the lips together not only offers a fixed obstacle to descent of the partially-reduced fundus, but, as very correctly stated by Emmet, establishes a force which is continuously operative in promoting complete reposition.

INJURIES AND LACERATIONS OF THE PERINEUM AND PELVIC FLOOR.

By HOWARD A. KELLY, M. D.,

Philadelphia.

Introductory.—For the following article the author has largely drawn the material from his own practice, which has been peculiarly rich in cases falling under the above title. The views derived from this source have been supplemented by condensed statements of his deductions from the writings of others. The endeavor has been made to treat the subject in a practical and useful manner, leaving historical questions and a statement of the abundant and original American work in this field until a future opportunity. Much is here said about "the recent tear," as the author holds it a matter of prime importance that injuries to the pelvic floor and perineum should be treated as soon as possible after their occurrence. He further believes that the recent tear is the form to which secondary tears must be reduced by proper denudation, when the method of suture in both will be alike.

The prominence given to "Relaxation" as the most important of all injuries will, it is hoped, if at first questioned, gain general acceptance, and thus hundreds of sufferers may secure relief who are to-day looked upon by gynecologists as having sound perineums. To mention all indebtednesses would be to fill pages with names, but it is impossible to omit special mention of my friends T. A. Emmet and Friedrich Schatz, and express many obligations both for direct teachings and germs of ideas which have proven pregnant with important facts.

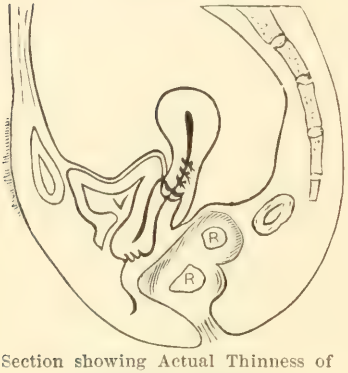
The pelvic floor is a thick, powerful diaphragm of interlacing tendinous, muscular, and connective tissues closing the outlet of the bony pelvis, stretching from the pubic rami and ischia to the sacro-sciatic ligaments and coccyx. Viewed from within in the female, the floor has the shape of a shallow funnel with an excentric outlet, the vagina, displaced to the front. Its principal strength lies in three systems of muscular fibres forming the sloping walls of the funnel. The posterior set extend from the spines of the ischia to the coccyx; the middle arise from the margins of the ischia and meet in a tendinous raphé connecting the anus and coccyx; the anterior comprise the

levator ani muscles of either side. This strong elastic bed is pierced by the outlet of the rectum and the outlet and inlet of the vaginal canal in the female.

The PERINEUM is that portion of the pelvic floor which lies between the anus and the extremity of the rectum and the posterior commissure of the vulva. (See Fig. 222.)

Under the ordinary conditions of health and normal functional activity this floor readily preserves its integrity, supporting both outlets in their proper relative positions, thus retaining the pelvic viscera lying immediately above, and effectually resisting the additional strains to which this part of the body is subjected in consequence of the erect posture and woman's activity as a laborer. It is due to the erect posture that the greater part of the repeatedly recurring impacts of walking and quick movement are spent upon this floor of the pelveo-abdominal cavity—a disadvantage not experienced by the quadrupedal mammals, in which these forces are distributed over the muscles of the abdominal wall. Upon severe exertion also, when the breath is held and the abdominal walls fixed, and the whole muscular system called into action, a great increase is added to the ordinary intra-abdominal pressure, felt equally in the pelvis and spending itself to the greatest disadvantage upon an unsound pelvic floor.

FIG. 222.



Section showing Actual Thinness of Normal Perineum.

INJURIES FROM WITHOUT.

The pelvic floor in woman is so well protected by the thighs and overlapping buttocks on either side, and by the powerful sacral wedge posteriorly, that it is but rarely injured by forces acting from without, unless associated with general injury and crush or contusion of other far more important structures, as frequently occurs in railroad accidents. We would thus naturally expect to find, what is indeed a fact, that the accidents most commonly recorded have been occasioned by long pointed instruments, which readily find their way between the thighs and pierce the floor: thus, women have frequently been injured by contusion or penetration of the pelvic floor from mounting a rickety chair, which breaks under the weight of the body, and falling on one of the upright pieces. Many women have been gored in this portion of the body by horned cattle, and children are often impaled by sliding down a haymow upon a concealed pitchfork. Several cases have

come to my notice in which little girls have had their perineum torn from vagina to anus, opening the whole recto-vaginal septum, by sliding down a baluster and striking the flat boss on the top of the newel-post.

Rape leaves indelible traces on the vaginal outlet and perineum, most marked in little girls, the extent of the injury being manifestly directly as the disproportion between the size of the orifice and the penetrating object. In one of the frightful records of barbarity in the West is a case, an example of others not always confined to savagery, in which a party of Indians, after killing a settler and his wife, took an infant daughter, and, to carry out their purpose, slit the perineum and recto-vaginal septum with a bowie-knife, and in turn raped the dying child.

Although the changes at the vaginal outlet, exclusive of the conditions of the hymen following sexual indulgence, are, as a rule, distinct and easily demonstrable, injury to the pelvic floor and perineum from this cause is rare. In a curious case observed by Dr. Joseph Price the horny penis of the husband perforated the perineum of his wife on their nuptial couch, leaving a permanent vulvo-rectal fistule, through which coitus subsequently took place. Sir Spencer Wells has also reported a similar case of injury. Improperly-made specular examinations and the use of the obstetric forceps frequently result in damage to the vaginal outlet, producing relaxation and laceration, resembling, however, the injuries of parturition, with which they will be described.

Treatment.—Where the pelvic floor is injured from without and special treatment of this injury is called for, apart from such treatment as is required by the other and graver associated injuries, the surgeon must be guided in general by the principles governing the treatment of lacerated, contused, or incised wounds elsewhere.

Contusions should be treated expectantly, with cooling evaporating lotions, making free incision upon the first sign of pus-formation as shown by tumefaction, pain, heat, elevation of body temperature, and fluctuation. Lacerated wounds with contused margins must be drained, with the approximation by suture of such parts as are sound. Simple lacerations or incised wounds should be closed at once by interrupted silk or gut sutures.

The cardinal principle throughout must be absolute cleanliness, best attained here by a rigid antisepsis, washing the wound thoroughly with a 1 : 1000 solution of bichloride of mercury, and dressing it with absorbent cotton, protecting it from the air. Especial care must be taken to prevent fecal contamination, to remove vaginal secretions, and to exclude permanently irritants from these sources from the parts involved. This is best accomplished by separate suture of the rectal and vaginal walls, when either canal is opened. The entrance of septic

material from these tracts upon the wound surface is the chief source of irritation, preventing primary union. Buried continuous or interrupted buried sutures of catgut (*vide* p. 751) give the quickest, surest, and best union of deep wounds, avoiding the common danger of attempting to grasp too much tissue in a single layer of deep external sutures.

In lacerations confined simply to the skin and tissues more or less superficial, interrupted sutures of fine silk or silkworm gut should be employed, embracing the whole wounded surface, and numbering from four to five to the inch, accurately approximating the skin margins between with superficial sutures. Over the wound thus closed or drained a dressing of bichloride gauze or carbolized cosmoline of 5 per cent. strength should be placed and held by a bandage. The dressings should be changed as often as soiled.

Injuries from Within.

Just as the sources of injury to the pelvic floor, acting from without, are diverse and rare, correspondingly uniform is the cause acting from within. To the parturient function women owe their great liability to the frequent injury of this portion of the body.

From disproportion of one sort or another, either in the size of the fœtus or in the size of the outlet, or in the time taken by the fœtus to displace the floor and dilate the outlet, destruction of tissue by pressure, tear, or over-stretching of the fibres crossing the floor and closing the vaginal outlet is a frequent result. So common indeed is their occurrence, and so serious in their consequences are the injuries thus sustained, that they bid fair to overshadow in importance any other single surgical affection.

The normal functional activity of the vaginal outlet, the excentric vent of the funnel above described, the most contracted and resisting part of the infra-uterine parturient canal, makes it necessary that a ring not greater in circumference than from two and a half to three inches should at the delivery of the child dilate to thirteen inches, and that after labor it should return to its former size and strength, continuing to support the vaginal outlet and preventing hernia of the structures above.

Function of the Perineum.

A correct appreciation of the function of the perineum and the vaginal outlet is better obtained by studies made upon the living subject, making careful comparisons between multiparous and nulliparous women and virgins, under varying conditions of pressure upon the

pelvic diaphragm, than by frozen sections which represent but a single plane at one time, and in which all parts are of equal consistence. The study upon the living subject is better also than that made upon the cadaver, where the post-mortem relaxation of all muscles exercising sphincter power is at once misleading as to the most important features of the investigation. The examination of the living subject should be conducted in the following manner: Introducing one finger into the rectum, and carefully palpating with the other hand over the skin surface of the perineum upward from the anus, over the fourchette, and into the vagina, the fact is at once evident that, without exception, in all nulliparous women the anterior rectal wall arches upward and forward and lies directly behind the skin perineum (Fig. 222), and that the thickness of the tissue between the finger in the rectum and the outside finger is rarely more than a fourth of an inch, and there is nothing more than skin, rectal wall, fat, and small muscles between the fingers. At the fourchette, where the depth of the perineum is greatest in the frozen section, giving it its imposing wedge form, the superficial tissues are felt in the living to be utterly lax and nothing more than the loose drapery of the outlet. It will be further observed also that in women who have never borne children the gluteal cleft is deep and sharp-angled, and the anal outlet has the appearance of being tucked up under the pubic arch, and the perineum is very small and shallow in every measurement.

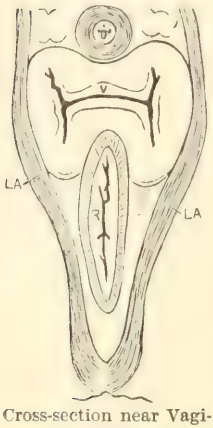
The true supporting structure of the outlet is discovered by further careful palpation of the posterior vaginal wall, which reveals at the introitus, just behind the hymen, a broad band of powerful resilient fibres extending transversely behind the vagina from the pubic ramus on one side to the pubic ramus on the other. This band or sling of muscular fibres is in some measure under voluntary control, and can, with the direction to the patient to "draw up," be made to pinch the finger forcibly, being again relaxed under the direction to "bear down."

It is these muscular fibres which impress the palpating finger as being a horizontal band from a third to a half inch in breadth lying behind the vagina, which are the true and sole supporters of the vaginal outlet, exercising the functions usually attributed to a "perineal wedge." They do not, however, pass directly behind the vagina, but, as shown in Fig. 223, LA, LA, taken from Henle, representing a cross-section a little higher up, embrace the rectum also, with which they are intimately connected, and by powerfully elevating it under the pubic arch thus indirectly embrace the vagina and close the outlet.

These fibres depend like strong arms from the inner surfaces of the pubic rami on either side, and unite like clasping hands behind the rectum, hugging in their embrace both rectum and vagina, and in their intact condition feel through the vagina as if crossing its posterior wall

almost horizontally. This method of the closure of the outlet is more diagrammatically represented in Fig. 224, where the arched line is the pubic arch, beneath which lie the urethra, vagina, and rectum surrounded and held up by the loop of levator fibres springing on either side from the pubic rami.

Fig. 223.



Cross-section near Vaginal Outlet.

Stress is laid upon the normally transverse position of these fibres governing the outlet, as we shall see farther on that the diagnosis of injury to the true supporting structures of the

Fig. 224.

Diagram of Vaginal Outlet, showing relations of levator, rectum, and vagina.

outlet is made by determining whether the direction of the fibres is transverse, vertical, or at an angle between the two, and that in prolapsus and relaxation of the outlet their direction is no longer nearly horizontal, but inclined or even vertical.

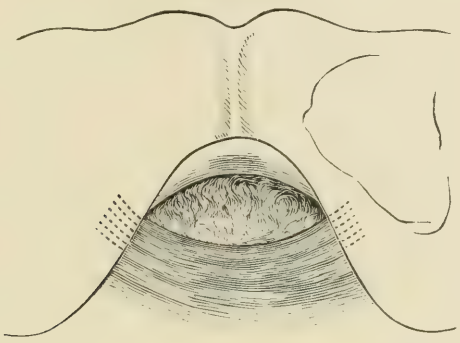
Rupture or separation of these fibres from their lateral attachments to the rectum and to one another posteriorly creates the lax open outlet through which the superincumbent structures roll out. So long as these fibres retain their normal connections and functional activity no prolapsus can occur. In pregnancy this tight sling of fibres is softened, in common with the other parts of the parturient canal, by the excess of blood and serum supplied during the months of gestation.

When the fœtal head impinges upon this outlet in normal parturition the first expulsive efforts drive the fibres down, then rotate them outward and forward from under the pubic arch, and finally, by impact following impact, they are gradually stretched and dilated until the head slips safely over without injuring the mother.

The result is far different if the head is unusually large or the chest broad, or if the head descends upon the outlet in a direction which does not allow the exercise of the gradual wedge-like action of the occipital extremity, or when it is driven suddenly through an unprepared outlet by abnormally strong expulsive pains, or, what is the same thing, is brought suddenly down and dragged through by the forceps. The relation of the fibres displaced to the advancing head is shown in Fig. 225, where they have been forced down and rotated outward from under the pubic arch, but, failing to yield in a vertical direction, finally extensive rupture took place.

Injuries arising from parturition are of two kinds—the visible tears, solutions of continuity in the tissues, manifest on inspection; and the invisible, concealed, or subcutaneous ruptures, when the laceration is

FIG. 225.



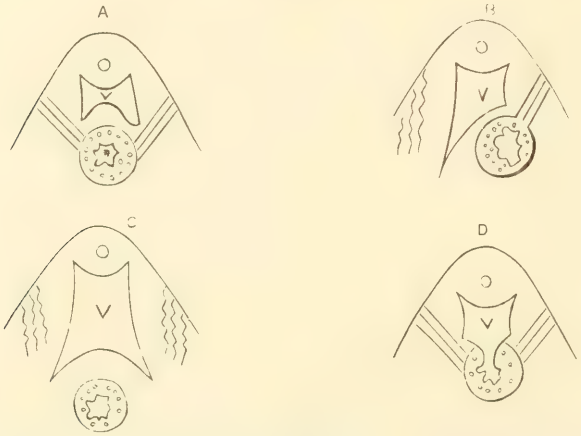
Outlet during Parturition, primipara; head at outlet. Levator fibres are *rotated outward* and *stretched*, but have not yet yielded in *vertical* direction.

submucous or muscular fibres and fasciæ have been over-stretched, subjected to minute lacerations in the fibrillæ, resulting in relaxation of the outlet. Injuries of the latter class, associated with or without, are of the greatest importance. It will be shown farther on that injuries of the latter class are a generally unrecognized but far more frequent source of distress than any other injury received in childbirth.

Character of the Injury produced by Childbirth.—The extent of the lesion produced varies from a simple superficial rent involving only the mucous membrane, so slight in extent and of such frequent occurrence as to be considered the natural product of normal labor, to a tear in the tissue involving the whole thickness of the recto-vaginal septum and extending far up toward the cervix, and leaving the patient with a cloaca or common genital and fecal outlet. Slight tears occur anywhere in the vaginal canal, being found above, at, or below the outlet. They are, however, most frequently observed at the fourchette, involving little more than the delicate fold at the posterior commissure. From this the tear may extend up to the outlet and down to the sphincter, and still remain superficial in character. A tear of another character often begins at the apex of the posterior columna rugarum [C], and extends a variable distance up one or both vaginal sulci, leaving the columna hanging as a loose tongue to contract and form a characteristic feature, a telltale of the nature of the original injury. This form of tear usually extends deeper into one sulcus than the other, and is at times continued up the vagina almost to the cervix. This is truly an inside tear, and is most frequently observed when there has been no instrumental interference to terminate labor, beginning at a point just in advance of the columna, within the vagina, and

not at the fourchette, the external perineum being involved, if at all, by the continuation of the tear started within at the outlet in both directions. Tears of this character have their greatest length in the axis of the vagina, in their depth reaching down on either side of the rectum as it lies behind the vagina, tearing it away from its connections with the levator ani, and following the natural law of extension in the direction of least resistance. The rectum is never included in an injury of this character. Complete rupture of the perineum is produced by a tear extending first through the fourchette, then down through the skin perineum, the external sphincter, and up the rectum. Fig. 225 shows the normal relations of the three canals held firmly up under the pubic arch by the loop of the levator fibres guarding the outlet. The same is represented diagrammatically in Fig. 226, A,

FIG. 226.



A, relations of levator, rectum, and vagina, diagrammatic. B, same, showing deep tear separating levator fibres from rectum in right sulcus. C, same, showing relaxation of outlet, separation in both sides. D, showing tear into rectum; levator fibres not injured.

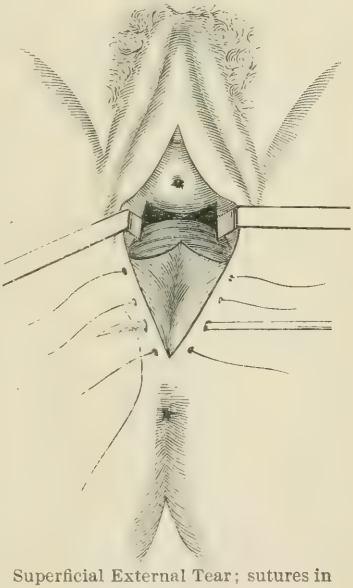
where the fibres are represented as directly attached to the rectum—a substitution which is an equivalent, as far as the control of the vaginal outlet is concerned, to facilitate the study of the effects of injuries upon the vaginal portion of the canal.

Fig. 226, B, represents a case in which the head has ploughed its way down the right vaginal sulcus, severing the attachments of these fibres on that side, but leaving the connections between rectum and levator on the left side undisturbed. In such a case the action of the uninjured fibres will sometimes so displace the rectum toward the sound side as to make the tear appear to be median.

Fig. 226, C, shows a rupture of the fibres on both sides and a dropping back of the rectal tube, leaving a great lax outlet without any support or supporting power. In Fig. 226, D, a complete tear is shown passing

up the rectum without disturbing the levator fibres on the sides, which explains at once the reason why prolapsus is so seldom associated with sphincter tears. The tear follows the simple law of extension in the direction of least resistance, and as less resistance is offered in the severance of the weaker connections between rectum and levator ani than in the additional task of breaking into the strong muscular rectal tube, the tear, beginning within the vagina, follows the direction of the sulci; and the inside tear is for this reason always either right or left lateral or both, and never purely median. When the tear is median it involves the fourchette and subjacent tissue, and extends over skin perineum, thus continuing up into the rectum, which, once opened in this way, now offers less resistance than the leaving it to open up a new track by its side. (See Fig. 226, D.) The importance of discovering the tear lying wholly within the vagina is very great, as here lie, as we have shown, the strong fibres controlling the outlet, so concealed in ordinary postures that injuries are almost always overlooked. Full view of the injury is at once attained with a good direct light, wide separation of the labia, and elevation of the anterior vaginal wall by means of a duckbill speculum. When all adhering clots have been removed an irregular, jagged, dark-red surface is exposed, and the transverse muscular fibres are often recognizable on the lateral wall of the torn surface.

FIG. 227.



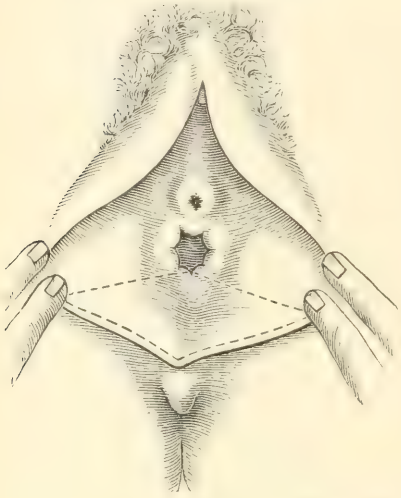
Superficial External Tear; sutures in position.

Superficial External Tear.—While the internal tear just described, lying in the axis of the vagina, is long, sometimes shallow, sometimes deep, always readily concealed by its position and the collapsing vaginal walls, the tear external to this, to which the attention of the profession has been constantly directed, involves the triangular area of tissue having its apex at the fourchette and its base on a line drawn from sphincter ani to the columna at the outlet (Fig. 227). The tissues included in this wedge have no relation to the support of the pelvic floor, forming but a part of the drapery of the vulvar orifice, serving to keep the labia from gaping posteriorly, and the sacrifice of this area of tissue alone involves no other inconvenience than a rare sexual disturbance consequent upon the sensitive scar-tissue which is sometimes formed. The extent of an injury of this kind is seen in Fig.

227 and in Fig. 228, an old tear, drawn from nature, the parts torn being included within the dotted quadrangular figure.

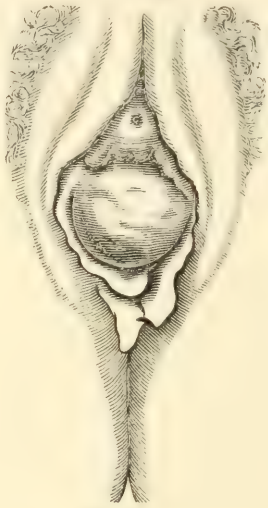
The small bag-like projection from the anterior vaginal wall, seen in Fig. 229, which forms such a characteristic feature in many of these

Fig. 228.



Old Superficial External Tear; scarified area within dotted lines.

Fig. 229.



Urethrocele.

cases, hanging underneath the pubic arch out of the vulvar orifice, is not the result of this small tear, but a production of the same original cause, being a downward displacement and rotation outward of a part of the anterior vaginal wall, having peculiar subpubic attachments. Repair of the injury below therefore gives no support to this prolapsing tissue above.

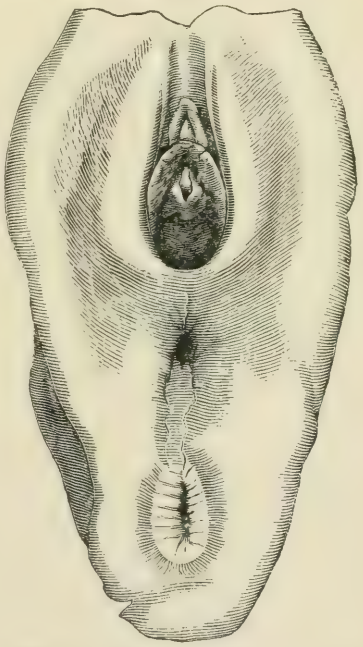
The recent tear involving the whole of this triangle is evident to the most superficial examination after delivery, and in the dilated overstretched condition of the tissues just after the injury often appears a more serious accident than shown to be by the after-history of the case. Upon separating the labia minora the lower end of each is seen to terminate in a ragged red triangular area, with its apex at the lower extremity of the nymphæ, the triangle of either side meeting with that of the opposite side in a sulcus extending up to the vaginal introitus as far as the columna. The torn surface is at times marked by irregular long-projecting teats of tissue.

Complete Rupture of the Perineum.—The complete tear through the perineum extending into the recto-vaginal septum is the result of difficult natural or instrumental labor, when the tear begins by the forceps dilatation of the outlet in advance of the head, brought down upon an unprepared perineum, which is dry and unyielding, starting at the

fourchette, continues through the skin perineum in the median line, through the sphincter into the rectum, and up the recto-vaginal septum for a variable distance. This tear is symmetrical up to the columna, exposing on each side a broad raw triangle, with its margins on vaginal, rectal, and skin surfaces. When this injury merely extends through the sphincter and does not pass up the septum, it is prone to escape notice and be mistaken for an ordinary perineal tear. The unfailing sign is the retracted pitted ends of the sphincter lying on either side of the lower angle of the wound. If it goes beyond the outlet, this tear almost invariably extends into sulci dissecting up the columna, leaving it as a projecting teat or tongue, with a deep furrow on one or other side of it. Very rarely the rupture splits the columna and extends on up in the median line.

Perforation of the Perineum.—Among the very rare injuries to which the pelvic floor is liable in confinement is perforation. The causes of this accident are the same as those operating in laceration in cases of unaided delivery, with faulty position of the head and deformity of the pelvis, or unusual expulsive pains when the head has reached the floor, preventing its proper presentation at the outlet. When the head has descended, instead of being directed gradually forward by the successive pains, the posterior part of the floor is distended, and so thinned out that under a sudden violent expulsive effort the perineum splits in a stellate direction on its skin surface, and the child is driven through without injury to the rectum posteriorly or the fourchette in front. Central rupture may even take place, and by the sudden relaxation produced by the yielding of the tissues the head at once change its direction, and the child pass out *per vias naturales*, the bridle at the fourchette being torn on the child's shoulder as it emerges, leaving an appearance like a simple badly-torn perineum.

FIG. 230.



Central Rupture of the Perineum (Hart and Barbour).

The mechanism of this injury can be better appreciated when we bear in mind that the inclined plane of the pelvic floor is formed of several series of muscles, and that a tear may begin in the fibres well back of the outlet, and, the plane being thus broken into, the head may

continue to pass in the same direction, perforating the floor. The accompanying figure (230) illustrates injury of this sort, and is taken from the specimen preserved in the Edinburgh Museum described by Sir J. Y. Simpson. The injury had been received a year before the death of the patient from phthisis, and, although no attempt had been made to repair it, the large fistule through which the child had passed had contracted down to the size of a goosequill.[1]

Relaxation or Over-stretching of the Vaginal Outlet.

Aside from the injuries to the perineum and pelvic floor above described, solutions in the continuity of the mucous membrane and the skin perineum extending a variable depth into the subjacent tissues, and visible upon inspection, there is yet a class of injuries standing by themselves in their anatomical peculiarities and their symptomatology which may be defined as "relaxations."

Relaxation of the pelvic floor and outlet (*vide* Fig. 226, c) is the result of submucous lacerations or over-stretching of the deep fibres which sustain the floor and guard the outlet, associated with or without visible injury. Relaxation is produced either by the presenting part ploughing a deep furrow in the muscular fibres traversing the floor, and leaving a broad gap in which the fingers can be buried, or by a succession of pregnancies, after which the fibres at the outlet fail to contract efficiently, hang uselessly at the sides, and a relaxed outlet is the result, as seen in Fig. 231, where the relaxed and normal outlets are compared. Relaxation is often associated with tear at another point: thus in forceps delivery the head is frequently dragged down, and the outlet rapidly over-stretched to such an extent that it may never regain its normal tone, the visible injury sustained being but a slight rupture at the fourchette.

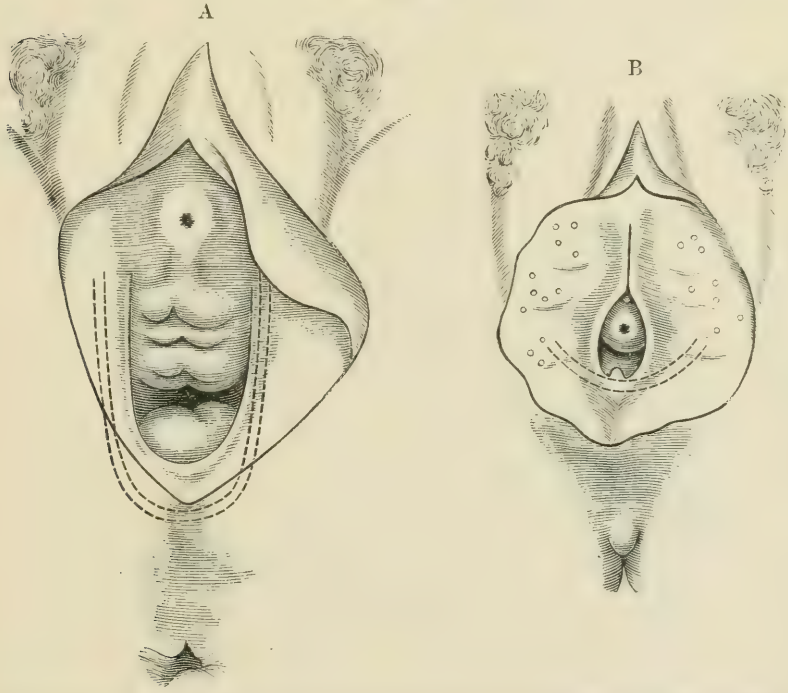
Diagnosis.—Owing to the laxity of all the soft parts after labor simple relaxation is manifestly recognized with difficulty. It is usually after the patient has been on her feet for some weeks or months that she first seeks advice for the distress and bearing-down pains in the lower part of the abdomen. A careful inspection now shows that the anal cleft, as pointed out by Schatz, is no longer a sharp, deep furrow, but is flat and shallow, and the anus, in place of being drawn up under the pubic arch, lies flat, exposed, and dropped back. The perineum is actually deeper than normal; instead of being of from two to three centimeters in depth, it is often four or five. On passing the finger within the outlet it no longer feels the powerful ridge of transverse fibres closing the outlet, but finds them instead hanging at an angle or even vertically at the sides, as shown in Fig. 226, c, and the nearest

[1] Hart and Barbour: *Gynecology*, 2d ed., p. 519.

complete sling of muscular fibres embracing rectum and vagina is a large open loop extending obliquely back into the pelvis, arising low down on either pubic ramus, and swinging around sometimes just in front of the coccyx. The difference in the direction and plane of these controlling fibres in the healthy and relaxed condition is altogether characteristic, and always afterward readily recognized when once discovered.

The efficiency of a perineum not torn on its skin surface is inversely proportional to its depth. (See Fig. 231.) The very deep perineums are weak: the shallow short ones are strong.

FIG. 231.



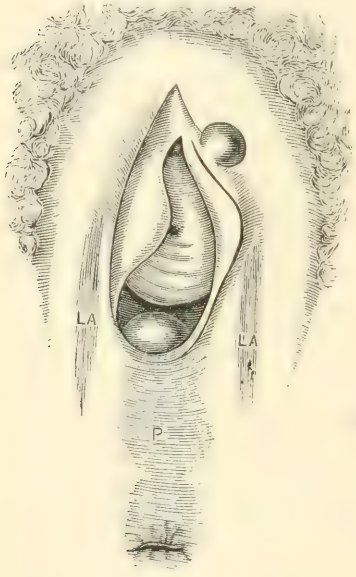
Relaxed (A) and Normal (B) Outlet compared, showing greater depth of relaxed outlet, surrounding which is a great loop of lax fibres, shown in dotted lines; also the shorter measurements of the normal outlet.

The SYMPTOMS attending this form of injury begin when the patient rises from bed. She then for the first time begins to feel discomforts attributable to relaxation, such as weight about the hips, pain in the back, lassitude, and inability to work, especially to do sweeping, washing, or scrubbing, without aggravating the pains and causing a distressing sensation of dragging from either ovarian region obliquely down into the pelvis toward the outlet. Others will often complain of a miserable feeling, as if everything were dropping out—symptoms all

of which are due to a want of proper support at the dependent outlet of the pelvis.

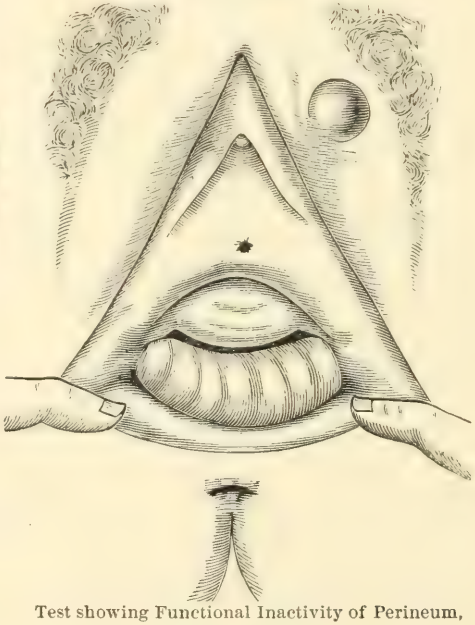
Nature's repair is often efficient in simple tears in restoring function, but in relaxation is inadequate, confining itself to the substitution at the outlet of loops of fibres of large calibre brought down from a higher plane of the levator. The constant spasmodic effort of these loops of larger radius may do much to prevent prolapse, but it is at the sacrifice of nerve-force and discomfort to the individual feeling the constant strain. Thus many outlets which appear on the gynecologist's table as functionally sound, refusing to respond to the ordinary tests described below, will, to the operator's great surprise, after etherization and complete relaxation appear weak and useless and relaxed. The perineum then falls back and the anterior and posterior vaginal walls roll out. In Fig. 231, A, is shown one of these relaxed outlets. Such a perineum would be usually estimated at a glance as uncommonly deep, strong, and sound, and pronounced perfect without further examination. But it is this very appearance in itself which is *primâ facie* evi-

Fig. 232.



Relaxation of Perineum of Multiparous Woman.

Fig. 233.



Test showing Functional Inactivity of Perineum, shown in Fig. 232.

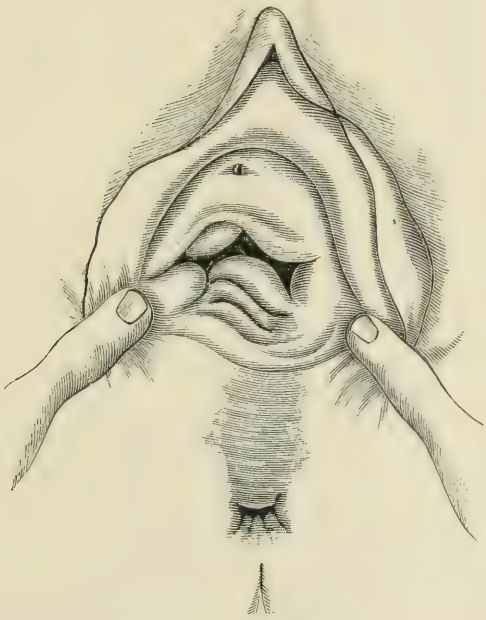
dence of relaxation and inactivity, and the digital examination made as described, by passing the finger just within the outlet and feeling for the supporting fibres, reveals them hanging vertically at the sides, as represented by the dotted lines. Before this woman had borne any children the anus occupied the position in Fig. 231, B, in a deep cleft,

and the depth of the perineum was, as shown, about half the present depth on the skin surface. Fig. 232 shows also a typical relaxed outlet drawn from nature; the flat cleft and the suspiciously deep skin perineum are distinctly shown.

In Fig. 233 is shown the best test for relaxation by burying each thumb or index finger into the perineum on either side of the fourchette, which is frequently intact; the fingers are then pushed downward, outward, and backward, as if the intention were to carry them under the pubic rami, when the outlet will open at once and the vaginal wall roll out in the characteristic manner shown.

In Fig. 234 another picture peculiar to these cases is shown, where the deep relaxed, over-stretched perineum, upon simply drawing the

FIG. 234.



Test for Relaxation, showing eversion of anterior, posterior, and lateral walls of the vagina.

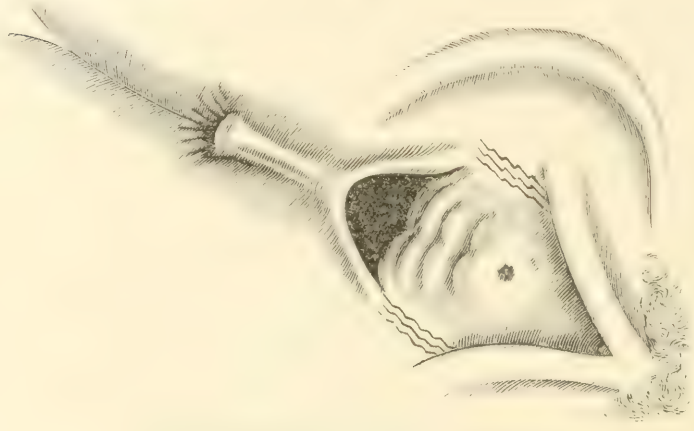
sides of the outlet apart, results in the rolling out of the anterior, posterior, and lateral walls of the vagina.

In the erect and in the dorsal positions the pressure within the abdomen tends to force the pelvic structures out of the weak outlet; consequently the outlet is always filled with prolapsing structures, and the actual gap in the support is often incorrectly estimated on account of this simple deception.

If we now place the patient with a relaxed outlet in a lateral semiprone posture, the conditions are reversed by the suction in the opposite

direction, and instead of the parts falling together from simple relaxation and want of support, they now drop apart to an extent in direct relation to the degree of relaxation and the negative pressure created here by posture. The effect of such a posture upon a case of relaxed outlet is seen in Fig. 235, which is in marked contrast to the tightly-

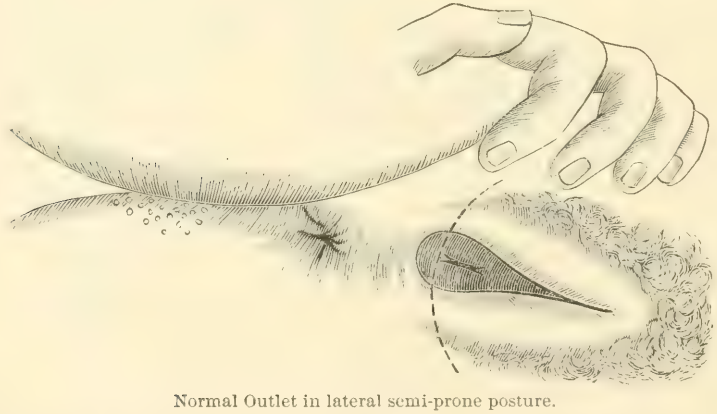
FIG. 235.



Test for Relaxation in lateral semi-prone posture.

closed sound outlet under the same conditions seen in Fig. 236. The loose inactive fibres are represented by the dotted lines hanging vertically at the sides, and the large opening looks directly up to the cervix

FIG. 236.



Normal Outlet in lateral semi-prone posture.

uteri, while Fig. 236 shows the firm band holding up the normal intact outlet, preventing any opening of the canal by simple posture.

Nature's method of repairing lacerations is often very efficient, and always a remarkable exhibition of her conservative powers. In

case of overstretching of the fibres supporting the vaginal outlet just referred to, the natural method is twofold: in the first place, when the strong band closing the outlet is broken down, the levator fibres next beyond are called into play, and the outlet thus more or less completely closed; these fibres, brought down from a higher plane, surround the outlet in a loop of much wider radius, and when the patient is not at perfect rest constantly endeavor to close the outlet by spasmodic effort, thus with some efficiency replacing the natural support. In cases of visible tear at the outlet, through the fourchette, or down through the sphincter, nature adopts other methods. Primary union of the torn tissues is effected when with suitable apposition of the opposite sides, with rest and absence of irritating discharges, complete reunion occurs within a few days. This method of cure without operation, so desirable and so confidently expected in many cases, is much rarer than is generally believed, and even with the most careful attention to secure all the favoring conditions usually fails. The common mistake in this matter depends upon the fact that some amount of primary union almost always occurs at the bottom of the wound, and the subsequent cicatrization of the remaining area finally leaves behind nothing but a delicate scar easily escaping notice. The only sure way to secure primary union is by the immediate operation.

In the inflammatory processes, granulation, and formation of scar-tissue at the seat of the tear, nature finds a substitute often very efficient for the original intact condition. Within a few days after the reception of the injury the torn parts begin to be active in throwing off the contused and necrosed shreds of tissue, in the formation of granulations, and finally forming broad lines of pink scar-tissue, which in time contract into fine firm white linear cicatrices.

The cicatrix thus naturally formed often effects what is so repeatedly attempted by operations—the substitution of the support of a plug of firm cicatricial tissue at the vaginal outlet, giving a new unyielding point of attachment to the torn muscular fibres, thus bridging the gap and restoring the lost support. This is the commonest form of repair, and is the efficient support in the great number of badly-torn cases which come to the gynecologist for other ailments, in which he reads the history of the past in the extensive cicatrices extending far up into the vagina, but finds a well-closed outlet.

In complete tear extending through the sphincter, nature is also able to do much to remedy the injury, in spite of the assertions of the authors to the contrary. When the tear simply extends through the sphincter muscle, the cicatrization which follows may bind the sphincter ends together, preventing more than slight separation, as shown in Fig. 237, B, and thus, although the ring is incomplete, by continuous strain, as in the case of the levator in relaxation, spoken of above, a

fair control of the bowels is established, and the individual may retain perfect control of the evacuations.

In tears extending farther up the septum the activity of the sphincter, no longer working concentrically, tends to contract to a point within the rent (Fig. 237, c), pulling out the ends and straightening the

Fig. 237.

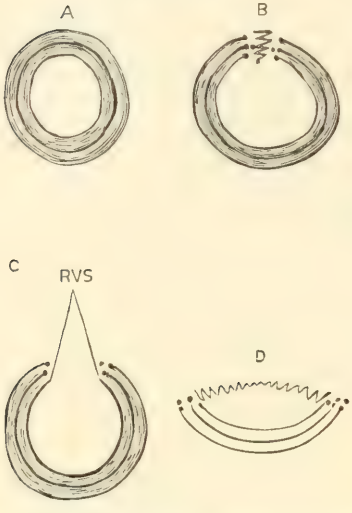


Fig. 238.

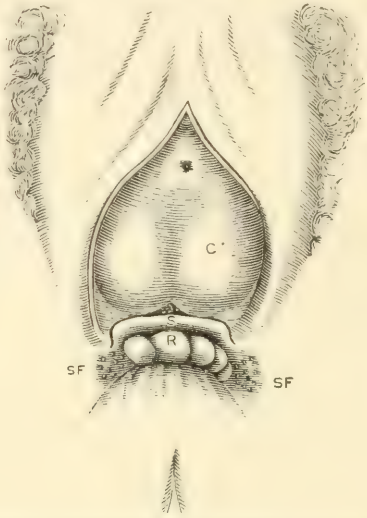


Fig. 237.—Sphincter Ani, intact in A, showing the result of a rupture simply extending through the sphincter in B, and a deep tear into the septum in C, and its results in D.

Fig. 238.—Complete Tear through the Sphincter and far up the Recto-vaginal Septum, which has been drawn down to a sharp, transverse ridge (S) across the anal outlet. Beneath this pouts the dark-red mucosa of the rectum, R, on either side of which are the pits SF, showing the position of the sphincter fibres.

muscle, as shown in Fig. 237, D, and Fig. 238, SF, forming the little pit on either side with its many little characteristic depressions. From beneath this ridge the red mucous lining of the rectum pouts, and above it lies a broad triangular glazed surface representing the tear on the lateral surface, as shown in Fig. 238.

Operative Treatment of Injuries of Pelvic Floor and Perineum.

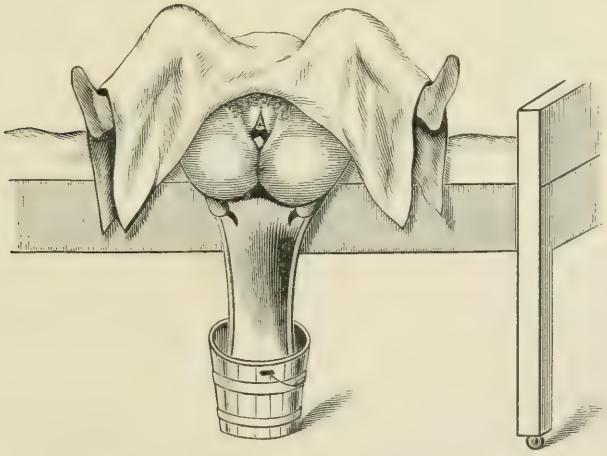
Operative procedures for injuries of the perineum and pelvic floor are designed to restore the integrity and the functional activity of the parts, and are classified, according as the operation is performed immediately after delivery, at an interval of two weeks or three weeks, during the granulation process, or after complete cicatrization, as primary, intermediate, and secondary operations. The general principles underlying all operations are the same; they are, antiseptic cleanliness throughout, perfect denudation, accurate approximation of the denuded

surfaces by suture, and rest of the parts until firm union has been secured.

The recent, primary, or immediate operation, performed immediately after delivery or on the day following, is to be preferred under all circumstances. Its advantages are manifold; the denudation is already made, and the parts can be approximated without sacrificing the strips of tissue cut away in the secondary operation; the numbness of the parts is almost always sufficient to allow the sutures to be passed without an anæsthetic; the patient is saved the discomfort of the slow process of granulation or cicatrization; and she is spared the suffering and changes which begin and continue to advance with the neglect of the primary operation until she is relieved by the secondary operation. Unless the parts have been greatly contused during labor immediate union can always be secured. The dangers of sepsis are not increased, but rather diminished, as the septic process usually starts at a point higher up in the genital canal, and the proper closure of the tear shuts this lower area off from the possibility of contamination.

The *technique* of the recent operation is simple. The only instruments needed are an elevator for the anterior vaginal wall, a pair of scissors, a needle, a needle-holder, and silk, silkworm gut, or silver wire for suture material. It must be constantly borne in mind that the success of all perineal work depends upon the three factors, perfect

FIG. 239.

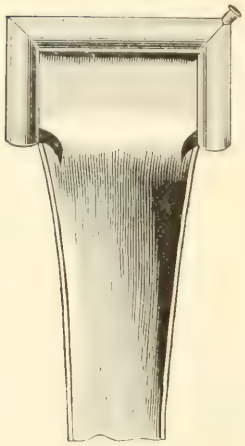


Disposition of Patient on the Bed for the recent operation.

denudation, perfect cleanliness, and perfect approximation throughout. The operator must first endeavor so to dispose the body of the patient that he may work with comfort and assurance of success; therefore the operation must never be undertaken with the patient lying awkwardly in the bed and with insufficient light upon the parts. If it is deemed

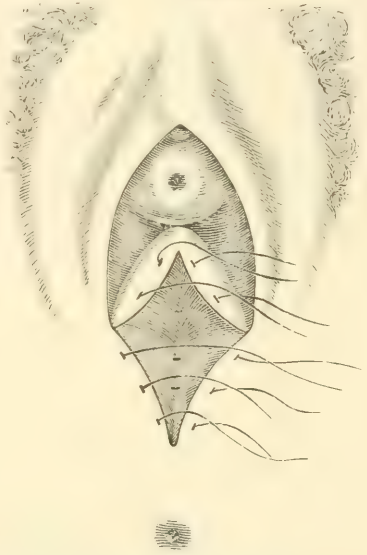
necessary that the tear should be repaired, every other consideration should yield at once, and the operator proceed to secure such disposition of the patient as will give him perfect control of the field. With this end in view, the patient should be brought to the edge of the bed, with the thighs well flexed on the abdomen, and suitably protected by a sheet covering body and thighs, as shown in Fig. 239, and the perineal pad (Fig. 240) under the hips, catching all fluids and conveying them into the bucket below. The operator then seats himself, with a good light falling over his shoulders upon the parts, and proceeds to

FIG. 240.



Perineal Pad.

FIG. 241.



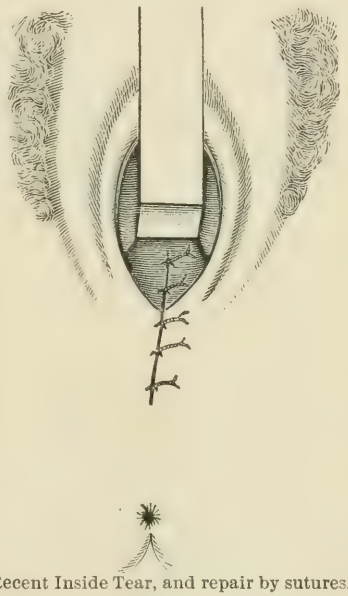
Recent Tear involving external triangle, requiring internal as well as external sutures.

close the wound. Denudation in the recent tear is already made, but it may often be improved by cutting off ragged masses and projecting teats of tissue. To prevent blood from flowing down from the uterus and obscuring the field of operation, a sponge or piece of gauze must be pushed up into the vagina. Frequent irrigation greatly facilitates the rapidity of the work and adds to the comfort of the operator, preventing the blood from coagulating in the tissues by continually cleansing them, and at the same time constantly washing instruments and fingers.

Superficial Recent Tear.—When the tear is confined to the superficial triangle from the fourchette to the sphincter below and the columna above as seen in Fig. 227, it may be repaired by a few external sutures, as shown in the diagram. When, however, the tear extends farther up into the vagina, it cannot be accurately approximated in this way, and

sutures must be passed, as shown in Fig. 241, which when brought up and secured leave the parts in the condition shown in Fig. 242, the anterior wall of the vagina being raised by a retractor to show the two inside and three outside sutures. These sutures are entered on one side a quarter of an inch from the margin, carried down to the bottom of the wound, appear there, re-enter, and reappear at the corresponding point on the opposite vaginal surface. They may cross each other, as shown in Fig. 250, on cross-section, where C represents columna, and A anus, with sphincter fibres above and below, and the sutures S S S are seen in cross-section, tied on skin and vaginal surfaces. The proper introduction of the sutures requires some knack and judgment. The threaded needle is caught by the holder at right angles or directed slightly away from the operator. A curved needle is entered on the vaginal surface at the upper angle of the tear, and with a sweep of the wrist carried under the tear and brought out on the other side at the same distance from the margin. This first and uppermost suture is important, as when properly introduced it prevents the formation of a pocket in which the discharges accumulate and often defeat an operation otherwise well planned. From this point down the sutures should be passed at least four to the inch. As suture material, silk, silkworm gut, or silver wire may be used. My own preference is strongly in favor of silkworm gut which has been preserved for some weeks in a 5 per cent. solution of carbolic acid in water. Any unevenness or pouting of the lips after the sutures have been brought together must be remedied by superficial sutures. When the sutures have all been passed they should then be tied, beginning with the uppermost and proceeding downward. The parts thus united are next dried off and dusted with a powder of boracic acid and iodoform, and the patient returned to her place in the bed. The urine should only be drawn so long as the patient is unable to pass it. Unless the lochia are fetid no other attention need be given the wound until the sutures are removed, from the seventh to the ninth day. Should the lochia be irritating or fetid, daily vaginal injections of a 2½ to a 3 per cent. solution of carbolic acid in water must be given, taking care to pass the nozzle of the syringe carefully, so as not to injure the field of operation.

FIG. 242.

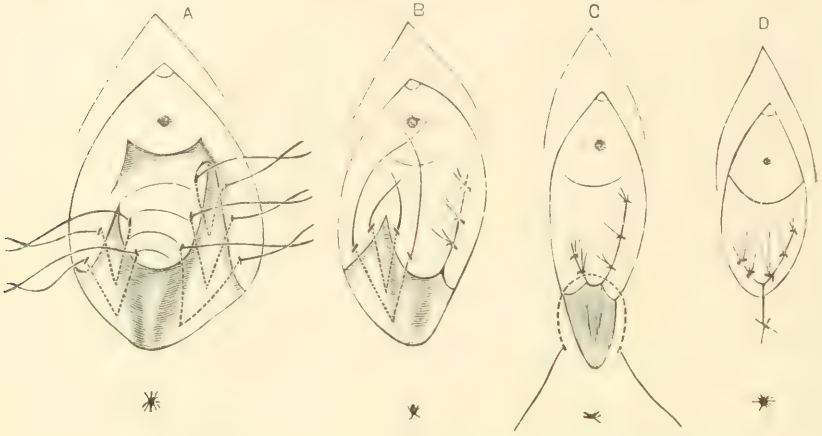


Recent Inside Tear, and repair by sutures.

Recent Internal Tear.—Where the recent tear involves the tissues lying within the fourchette and around the columna, it invariably passes up one or both fornices, leaving the columna projecting as a teat in the middle, as seen in Fig. 243.

A tear of this kind demands treatment differing widely from that last described. The extent of this injury is only seen on separating the

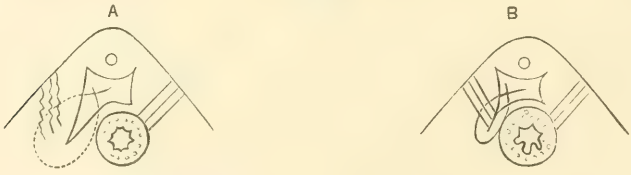
FIG. 243.



Recent Tear inside Vagina, and Suturing: A, sutures all passed; B, drawn up on left side; C, drawn up on both sides and crown suture in place; D, all sutures tightened.

labia and elevating the anterior vaginal wall with a retractor. It is here that rupture often occurs, extending around the columna and associated with tear or overstretching of fibres below the field of observation, and followed by relaxation of the outlet. The importance, therefore, of securing immediate union is very great. With suitable exposure, while an assistant holds the retractor raising the lax anterior wall, the operator proceeds to pass the upper stitch, closing the wound at its upper angle. The sutures below this must then be passed with the two distinct objects in view of grasping the torn muscular tissue on

FIG. 244.



Object attained by suturing shown in Fig. 243.

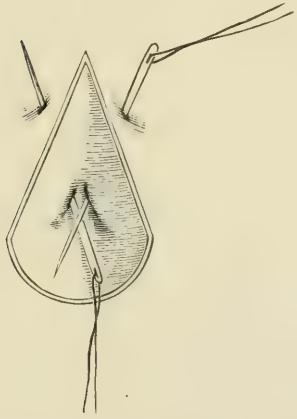
the lateral wall by deep suturing, as shown in Fig. 244, and of exercising a definite lift, each suture helping to lift up the pelvic floor.

By the very mechanism of the distension of the pelvic floor during parturition the central part suffers the greatest displacement, and when

torn loose from its muscular attachments on the lateral walls remains sagging below the parts on the sides which are connected with the unyielding pubic rami. Thus a simple transverse suture will unite structures not naturally opposed. This can best be remedied in the immediate operation by a peculiar suture devised by Dr. Emmet, which is carried out by entering the needle on one side of the tear and carrying it from above downward toward the operator, as shown in Fig. 245, bringing it out at the bottom of the tear, re-entering it, and carrying it up on the other side of the tear. The figure shows the same needle entering and appearing at the bottom of the sulcus, and re-entering and appearing above on the opposite vaginal surface. This suturing must be done on each side of the columna, as shown in Fig. 243, if the tear extends up both sulci.

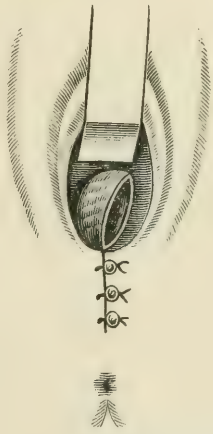
Fig. 243, A, shows the triangular tear as it extends up each side of the columna [C], and the sutures all introduced in the manner described and ready to be drawn up; the next figure shows the change produced

FIG. 245.



Downward and upward direction in which the needle is passed to lift up the floor of the tear.

FIG. 246.



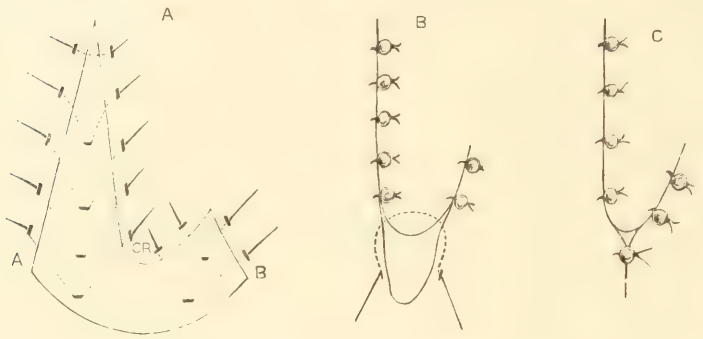
Bad result of only passing external sutures.

by tying a single set of these sutures on the left side; while in the following figure is seen how completely the large area of displaced ruptured tissue is carried up into place and disposed of by this method of suturing, leaving but a small boat-shaped area externally, which is closed by a suture, shown in the third figure, entering well back at the lower angle of the tear, brought out in the vagina on its lateral surface near the apex of the columna, then, transfixing the end of the columna, re-entering on the lateral wall of the opposite side, emerging finally on the skin perineum opposite the starting-point, thus carried completely around the exposed area, and acting when drawn up like a purse-string, as seen in Fig. 243, D, which shows the final effect.

The effect of pursuing the common method of simply closing the tear externally and neglecting the vaginal surface is shown in Fig. 246, where with perfect external closure and an apparently good perineum a large open pocket remains within, to catch discharges and defeat with certainty the attempt to secure primary union beyond the mere skin surface.

This method of suturing is also shown in Fig. 247, where the denuded

Fig. 247.



Suture in recent inside tear, shown diagrammatically.

area and the lines of suturing are shown diagrammatically. In A the visible portion of each suture is indicated by making the line heavier, and that part which lies buried in the tissues is represented by the finer line continuous with the heavier. The effect of drawing up and shotting the sutures laid in A is seen in B, where also the crown stitch has been introduced. In C is seen the final effect of drawing up the crown stitch. No special sutures are required to bring together that part of the tear which lies below the sulci and the apex of the columna. The difference in the areas of B and C shows how marvellously the more external part of the tear is disposed of by this method of suturing described, so that in C but a single external suture is needed to bring the whole together.

In Fig. 244, A, is shown the tear in the right sulcus in transverse section, as represented also in Fig. 226, B, showing what is accomplished by the suture grasping the torn muscular fibres at the side and the connective tissue alongside of the rectum on its median aspect; while in Fig. 244, B, is shown the effect of drawing up this suture and bringing the torn structures into apposition. The suture is seen thus to act as a splint lying in the tissues on either side of and parallel to the wound surfaces. For this purpose the silkworm gut is pre-eminently suitable, occasioning far less puckering and gathering of the tissues into a bunch than does silk or any more flexible material.

Recent Complete Tear; Recent Tear through the Sphincter.—The

recent tear extending through the sphincter into the rectum calls for a somewhat modified plan of treatment, necessitating greater care and accuracy in passing the sutures, as a failure anywhere along the line is apt to result in a disability as bad as the original condition. In view of the distressing nature of the symptoms, the discomfort and the disgusting results following this injury, it is of all others the most important, and demands immediate action on the part of the operator. Defeat may arise from several sources: the tissues which have been bruised may slough; the field is open to contamination from the lochia, as in tears at the outlet; and there is added the increased danger of septic absorption from the communication of the wound with the rectum, and the difficulty of effecting a complete closure when sutures are to be passed in several opposing directions, without preventing union by the very means which are designed to promote it.

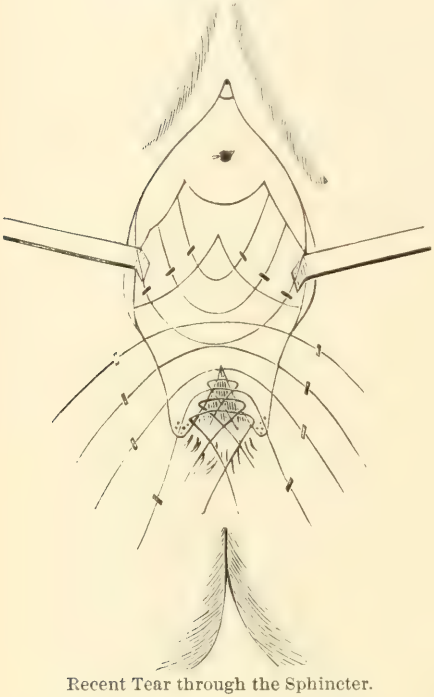
Operation.—The great difference between the operation for complete tear and the closure of tears of the superficial external perineum and within the outlet lies in the efficient closure of the rectal rent and in the directions in which the sutures are passed.

The patient must be brought to the edge of the bed as already described (Fig. 239), with thighs well flexed on the abdomen and the perineal pad beneath, and two retractors introduced into the vagina on either side, exposing the wounded surface, facilitating the passing of the sutures. The parts must be thoroughly cleansed and kept clean by frequent douchings with plain water, and a plug laid in the rectum, with a string attached, to prevent evacuations soiling the wound. Bichloride douchings must not be used in rents involving the rectum, as the fluids have a tendency to escape into the rectum, and, being retained, to undergo absorption, which has resulted fatally to the patient.

The sutures may be passed in several ways to secure the chief point of importance, the exact coaptation of the torn surfaces in their natural position, avoiding at the same time strong traction in opposite directions by two sets of sutures. Silk for the superficial, and silkworm gut for the deep sutures, yield the best results. When the tear extends in the vagina up to the columna, the rectal rent must be closed first, and the rectum separated from the wound by the introduction of a number of interrupted sutures about a sixth of an inch apart, as shown in Fig. 248. While the upper angle of the rectal rent is lifted up by a tenaculum, these sutures are entered close to the mucous surface at the margin of the tear, and carried an eighth of an inch into the tissues, brought out and carried across the rent, re-entering and appearing on the rectal surface of the opposite side. These sutures may be tied either as they are introduced or left long until all have been passed, when all are tied, beginning with the uppermost. The rectal rent is thus closed down to the sphincter. Two or three fine sutures may now be passed in like

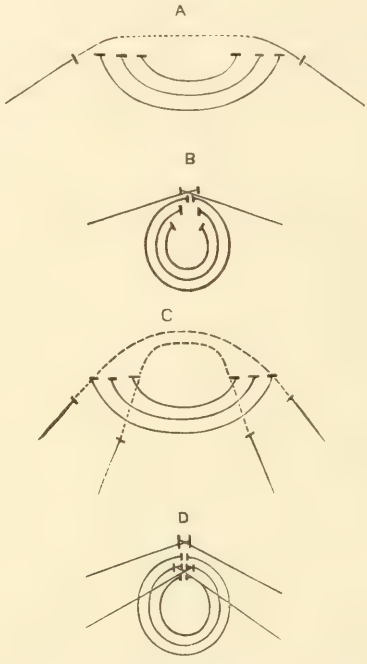
manner directly through the sphincter ends, or, as usually practised, union of the sphincter may be ensured by introducing a stout suture vertically below and behind its torn extremity, and carrying it completely around the upper angle of the tear if shallow, or bringing it out and entering it on the wounded surface above the row of rectal sutures, as shown in diagram, Fig. 249, C and D. A and B show how imper-

FIG. 248.



Recent Tear through the Sphincter.

FIG. 249.



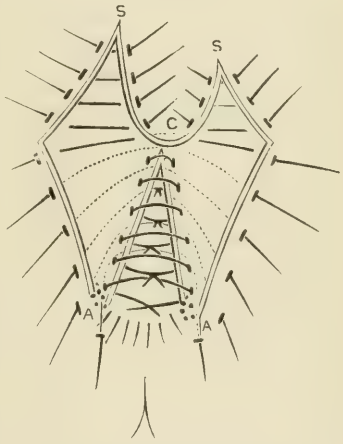
Introduction of Sutures to keep sphincter ends together.

fectly the ends of the sphincter are brought together by a suture introduced on a line with the ends of the sphincter, as shown in A. In C is shown the correct introduction of two sutures, bringing into accurate apposition the sphincter ends, seen in D.

For shallow rectal sutures silk or catgut is best, while silver wire or stout silkworm gut is best to encircle the sphincter ends. These materials will hold without cutting if the tension is distributed over a sufficient number of sutures. Sutures are next entered on the vaginal surface of the wound, beginning at the angle. A number of these should be passed transversely if the tear into the vagina is shallow; finally, the wound is brought together on the skin surface by a suture passed as shown in Fig. 248, as in the ordinary perineal tear, to which condition the wound has been reduced by the closure of the rent in the rectum.

When the rent extends farther up the recto-vaginal septum, into the vagina and into the sulci, the plan of suturing must be modified, as shown in Fig. 248. The sulci must first be closed, as seen in Fig. 250, by sutures passing down to the floor of the rent, beginning in the angles down to the rectal tear, when this should be closed as described and shown in Fig. 250. The skin surface is closed last of all by a series of deep-laid sutures, the uppermost grasping the point of the columna and bringing it down to the skin surface. If silkworm-gut sutures are used, they may be cut an inch or more in length to facilitate removal, all the more external sutures being left untied until the full number have been passed, when they are brought together one after another, each one being tested as it is drawn up, to make sure that the apposition is perfect, and then closed from below upward to the fourchette. Any pouting or unevenness between the sutures must be carefully disposed of by as many superficial and half-deep sutures as may be necessary to secure the utmost exactitude in the apposition. No special dressings are necessary, the parts simply being kept perfectly clean and douched if required. The bowels may be moved as early as the third or fourth day without detriment, the patient taking a laxative, assisted if necessary by a rectal enema of a pint of warm water rendered milky with soap, containing an ounce of inspissated ox-gall. The insertion of the point of the syringe for the purpose of giving an enema should never be trusted to an inexperienced nurse. Operators have been frequently defeated in their best directed efforts by the clumsiness of an attendant actually plunging the point of the syringe between the sutures and forcing the injection into the perineum.

FIG. 250.



Complete Tear, extending beyond the columna (C) up into both sulci.

In giving the enema the patient may lie conveniently upon her side with flexed thighs, and the nozzle of the syringe should be introduced, pressing back on the posterior margin of the anus. If the discharges from the vagina become fetid and irritating in character, a vaginal douche of a 2 per cent. solution of carbolic acid in water should be given twice daily, observing the same care about the vaginal sutures, and making pressure with the point of the syringe on the anterior vaginal wall. All the stitches which can be easily reached should be removed from the ninth to the tenth day, while the remaining sutures, if silkworm gut has been used, may be left until the patient rises from bed at the

end of two weeks. The urine should be drawn every four to six hours until the patient is able to void it voluntarily. The sexual relation and any strain, such as is involved in household duties or yielding to the maternal instinct and constantly lifting up the baby, should be prohibited for at least three months, when the firm knitting of the tissues will ensure the permanent success of the operation.

The Intermediate Operation.—The intermediate operation is undertaken at a time varying from ten days to three weeks after labor. It differs widely from that just described, in that in the latter the denudation is already made and the tissues are soft and relaxed, while in the intermediate operation the granulation-tissue must be removed, and there is always present abundant young vascular scar-tissue. The appearance of the parts also differs, as shown in Fig. 251. The walls being rigid, the area of the tear is distinctly mapped out, the lateral walls cupped, and at the lower extremity of the nymphæ, in the place of the fourchette, are two very prominent pyramidal teats of tissue projecting from the lateral wall toward the median line, at the point where the external becomes continuous with the internal laceration.

Freshening.—This operation was especially urged by Dupareque, but has been commonly considered by other operators as the least favorable time for freshening the wound and securing good union by suture, both because of the condition of the patient and the peculiar condition of the tissues. The selection of this time is justified by the distress occasioned by the granulating surfaces and the formation of the cicatrix. The time for operation is between the first and third week following delivery. The whole operation, freshening and suture, may be conducted under the local anæsthetic influence of a 10 per cent. solution of cocaine.

After a satisfactory exposure of the injured surface by bringing the patient to the edge of the bed or placing her on a table, the wound is carefully dried, and a piece of cotton saturated with the cocaine solution is laid flat on the granulating surface, covering the whole area. After five minutes the cotton is removed, and the whole surface rapidly scraped with the blade of a sharp scalpel until all granulations are removed and a raw, fresh, and freely oozing surface is exposed. The area is not so extensive as in the recent tear, owing to the formation of the scar-tissue, and not so contracted as at a later stage. The fresh scar formed on the margin of the wound must be thoroughly broken down and removed by the scraping, which is carried well into sound tissue.

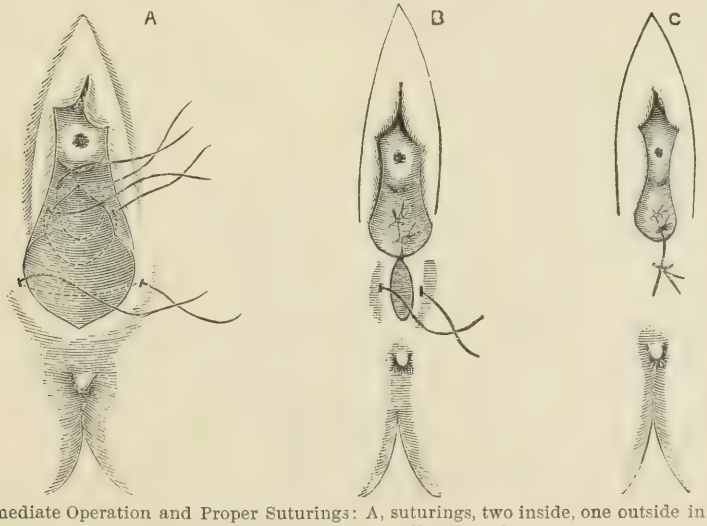
Sutures are passed as shown in figures in diagram 248, introduced closer to the margin of the wound than in the immediate operation, as far as possible entered on the inside. Fig. 251, A, shows the appearance

of the parts with the sutures in place, while in the second the inside sutures are tied, and in the third the operation is completed by tying the last external suture.

Where the tear has been complete and the intermediate operation is undertaken, denudation is made in the same way, and the sutures introduced as described in the immediate operation. The parts must be kept perfectly dry after suturing, or if wet with secretions must be douched daily with an antiseptic solution. The patient should exercise the same care regarding strain and the sexual relation as after the primary or secondary operation. The stitches are to be removed from the eighth to the tenth day, as usual.

Secondary Operation; Operation for Old Tear.—Secondary operation is performed upon the perineum after the formation and contraction of the cicatrix at a period varying from several months to many years after the injury. All granulations have disappeared, and the new vascular, tender cicatrix has contracted to a lineal scar with radiating lines, and in the surrounding tissues all inflammatory disturbances have long subsided. The character of the secondary operation differs according as the original recent injury involved the parts just within the outlet of the vagina, the external triangle of the perineum,

FIG. 251.



Intermediate Operation and Proper Suturings: A, suturings, two inside, one outside in place; B, inside sutures drawn up; C, all sutures drawn up.

or extended beyond this triangle to include the sphincter and part of the recto-vaginal septum. The scar cannot always be readily found, but a patient search will reveal its presence by pulling the tissues apart, when it appears as a white line making a distinct break in the natural furrows of the tissue which run to this point, end abruptly, and begin

anew on the other side of it. The increased resistance of the scar-tissue is also easily recognized by the palpating finger.

Where the scar-tissue is confined to the vaginal outlet there are not, as a rule, any associated symptoms unless they are connected with relaxation of the outlet. As has been shown, the formation of the cicatrix is conservative, giving new points of attachment for the muscular fibres supporting the outlet. To allow for the traction and displacement caused by the scar, the denudation should extend freely beyond its borders.

Instruments.—The instruments needed for secondary operations upon the perineum are few and simple. Emmet's right and left scissors curved on the flat are a great convenience, but may readily be dispensed with for a single pair of straight scissors curved on the flat; three tenacula; a pair of dissecting forceps; straight or curved needles; a needle-holder; silk; silkworm gut; an irrigator; perineal cushion; and "beinhalter" or "crutch."

The preparation for the operation involves the care of the patient throughout a short period immediately preceding it, and the arrangements in the operating-room prior to commencing the restoration of the injured parts. Where it is possible to secure every attention and a few days or weeks are not important, a course of daily warm baths, with friction of the skin, massage, and soft diet, careful regulation of the bowels, and two vaginal douches daily, will always be of advantage. In the poorer classes, however, where every day counts, and where the mother cannot remain long away from her family, but one or two days of preparation are absolutely needed. The most important preliminary is the thorough evacuation of the bowels by means of Epsom salts, compound licorice powder, or castor oil, given eighteen hours beforehand, and assisted not less than six hours before operation by an enema of a pint of warm water and soapsuds. The purgative and the injection must not be given too near the time of operation, or the operator will be in constant danger of sudden violent explosion of the liquid contents of the rectum upon his person, seriously disturbing the progress of the work. To prevent this and allay nervousness a suppository containing a grain of the aqueous extract of opium may be given with great advantage an hour before the operation.

Time for Operation.—One or two weeks after the menstrual period is the most convenient time, although the appearance of the menstrual flux within the few days following operation will not interfere with the success of the result.

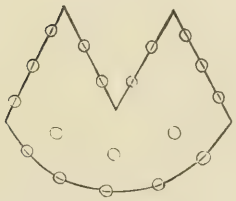
Anæsthesia.—Ether is to be preferred under the ordinary conditions of administration of anæsthetics prevailing in most hospitals, but it will be necessary to substitute chloroform in renal cases, and occasionally in others not affected by ether, or choking up with râles in the

lungs, or otherwise badly affected by ether. Chloroform usually acts happily in such cases. It has several times happened to the writer that a patient who has been breathing a dense vapor of ether for a quarter of an hour, and opens her eyes to answer a question, has dropped quietly to sleep after a few whiffs of chloroform.

The best method of giving chloroform is through the Junker apparatus, requiring one assistant to give his exclusive attention to its administration, while another keeps his finger continually on the pulse. Chloroform given on a napkin by an assistant only accustomed to the use of ether is exceedingly dangerous. Nervous cases greatly dreading the anæsthetic, or those taking it with bad effect, and cases suffering from phthisis or other chronic disease, may be operated upon under a local anæsthesia produced by careful multiple hypodermic injections of an 8 per cent. solution of cocaine. This method should not be employed by a slow operator, who will spend three-quarters of an hour to an hour on a perineal operation, as the effect of the drug wears off after the first half hour, and it will then be necessary to resort to ether or chloroform.

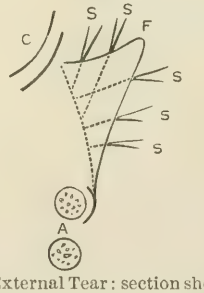
Fig. 252, representing an area to be denuded on the posterior vaginal wall, shows by a series of small circles the points for injecting the cocaine solution. A hypodermic syringe is filled and pushed quickly in an oblique direction just under the mucous membrane, and about half a minim injected at each puncture at points about a fifth of an inch apart. After waiting three minutes the operator may proceed with impunity, cutting the tissues rapidly away in long broad strips. In this way the little pockets of injected cocaine solution which have already paralyzed the sensory nerves of the part are being continually opened into and let out on the denuded tissues, and thus perpetually bathing the surfaces and keeping up the anæsthetic effect.

Fig. 252.



Points for Multiple Hypodermic use of Cocaine.

Fig. 253.

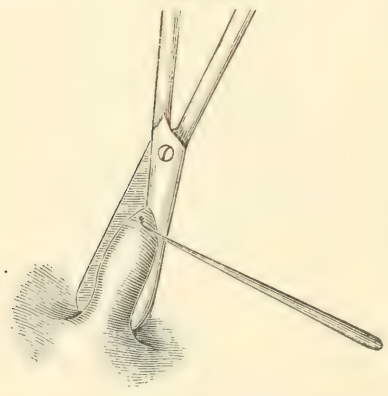


Superficial External Tear: section showing track of sutures, S, S, crossing each other; C, columna; A, anus; F, fourchette.

Cleanliness throughout the operation and during convalescence is one of the chief factors in successful work. It is best secured by thorough cleansing of the whole vaginal, and if necessary uterine, tract

previous to operation, and by equal care during operation to admit no septic matter, and by such efficient closure of the wound as will prevent the subsequent entrance of septic material. The abundant use of pure water fulfils all the indications of perfect cleanliness, and the writer has long since dispensed with any but an occasional use of sponges, operating under a steady flow of water which has been sterilized by boiling, and afterward set aside and decanted before use. The douche apparatus is a glass bottle, with a nozzle below, holding a gallon of water, or, for convenience in carrying to private houses, a soft rubber bag for a reservoir, which is hung three feet above the level of the table. The water is delivered through a rubber tube terminating in a hard point, with a cock controlling the flow. This is set to trickling continuously over the field, guided throughout the operation by an assistant. This use of water does not simply substitute, but has a great advantage over the use of sponges; the blood is washed away without clotting as soon as it appears on the wound. Instruments remain clean, and, above all, the hands are kept clean and free from the stickiness of fresh blood, in addition to the fact that the field is not constantly obscured by a sponge often manipulated by an awkward assistant. Any quantity of water can be used with impunity if the perineal cushion be placed under the patient's buttocks. This pad, shown in Fig. 240, is rectangular, consisting of an inflatable rim with a floor and an apron of rubber sheeting. In using the pad the patient's clothes are pulled up and the buttocks brought down on the pad over the edge of the table, when any water used runs down upon the floor of the cushion, and, being prevented from escaping on to the table by the rim on three sides, flows over the apron, directed toward its centre by a small flap attached to the rim and the sheet, when it runs over into the vessel below.

Fig. 254.



Method of Using Scissors in Denuding.

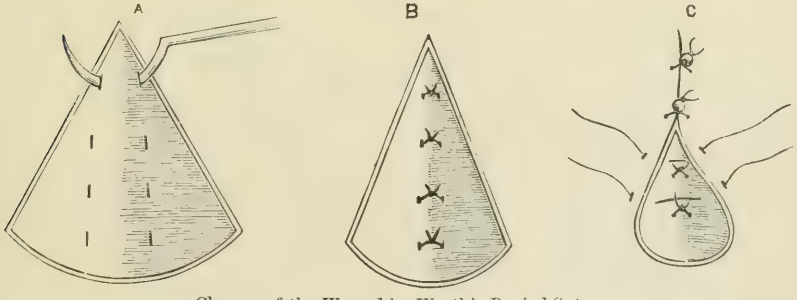
Denudation is best effected by using a tenaculum, as shown in Fig. 254, which is hooked into the tissue to be denuded, and, raising it a little and pulling gently in a direction opposite to that in which it is desired to cut, the scissors are buried to the heel and made to take long sweeping cuts at every closure. The best tenaculum for this purpose is very light, made entirely of metal, and with the point set at right angles to the shaft. The tongue of tissue freed by the first cut must

be held down parallel to the scissor-blades, which are again buried to the heel, and continue to make sweeping cuts, removing the tissue in long strips. Denudation by nicking and snipping off little pieces is a pernicious habit, delaying the operation and leaving an ugly jagged surface which does not unite readily.

Buried Sutures.—The best of all methods for bringing together broad surfaces of freshened tissue is by buried sutures of catgut, recommended by Prof. Werth of Kiel. In this way, instead of grasping the whole denuded surface in a single loop, as seen in Fig. 255, A, which when drawn up and tied puckers and purses the tissue, as seen in B, with the exertion of considerable traction, the tension is here distributed over two or more layers of sutures, all but one of which are hidden away out of sight, "buried" left in the tissue, and ultimately absorbed, thus preserving the original depth of the wound, preventing puckering, and distributing the tension necessary to bring the denuded surfaces into contact. Surfaces can by this means be brought together which could not possibly be drawn into apposition by a single row of sutures embracing the whole depth of the wound.

The method is as follows: A needle threaded with catgut is entered at the upper angle of the wound on its freshened surface, avoiding the vaginal mucous membrane; the thread is drawn through and tied with three knots to prevent slipping, when a continuous or interrupted suture is carried down the bottom of the wound, about four to the inch, until the lower angle is reached, as shown in Fig. 255, B. In using the

FIG. 255.



Closure of the Wound by Werth's Buried Sutures.

continuous suture, each time after the needle is drawn through the tissue the catgut is pulled taut and held by an assistant, preventing slack in the sutures already taken, and the wounded surface is thus accurately approximated and diminished in size. Fig. 255, A, shows the area to be approximated and the points of entrance of the sutures; B shows the effect of the first tier of sutures introduced. Above this another tier of sutures is taken, and so on until the whole denuded surface is approximated. In using the running suture in the second row it is

continued back from the lower angle of the wound to the upper angle, the starting-place, to form the second tier, then down again, until the wound surface is closed. The rows of sutures thus laid one above the other must be evenly applied, and care taken to avoid encroachment upon the row immediately below or leaving any considerable space between the rows, avoiding also cutting the sutures below with the needle—an accident particularly disastrous in the use of the running suture. The sutures should not embrace more than from a quarter to a third of an inch of tissue in depth. The catgut used for this purpose should be slightly chromicized to prevent too rapid absorption.

The tissues thus joined will rapidly unite, and require no further attention than a dry dressing or occasional irrigation to ensure cleanliness. The sutures are absorbed about the time firm union has formed, and the wound requires no further attention.

The repair of the external tear resulting from the recent injury shown in Fig. 227 is simple, and may be confined to a free removal of the scar-tissue. When the scar has been taken away and the surrounding parts relieved from the traction, the denuded surface will be seen to be larger than expected, and the approximation of the raw surfaces on the opposing sides will then fully restore the parts to their original condition. The best suture materials are silkworm gut and silk. After the introduction of the sutures on the vaginal and skin surfaces, with superficial sutures in sufficient numbers to secure exact apposition and prevent pouting lips between the sutures, as shown in Fig. 268, the parts should be thoroughly dried and sprinkled with iodoform or the subiodide of bismuth. The patient may be allowed to turn over on to her face to urinate after the operation, and while keeping her bed need not preserve any special posture. She will require but little other care than rest and cleanliness until the removal of the stitches on the eighth day.

Laceration of the Perineum involving the Sphincter Muscle.

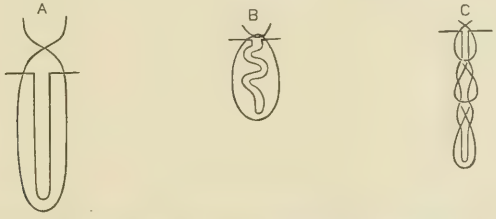
The symptoms and characteristic physical signs of this injury have already been described. The principles guiding the operator in the treatment of the injury are, in general, similar to those governing the treatment of the recent tear involving the sphincter, with the added differences and difficulties arising from changes produced by cicatrization, contraction of the sphincter, and the displacements consequent upon posture and strain. The chief difficulty lies in the extent of the denudation, its irregular form, and the number of sutures used, which are passed in different directions. The tension sometimes exerted by the sutures in opposite directions causes failure of union in the more

central parts, and ends by forming a recto-vaginal or recto-vulvar fistule.

A fundamental cause for failure lies in the communication of the wound with the rectum and the fecal contamination, also resulting in recto-vaginal fistule.

In this as in other perineal operations good results are never attained by fitting any particular pattern devised upon paper on the parts; but with the recognition of the individual peculiarities of each case and a correct appreciation of the changes which have been produced by time, and thus being able to retrace the parts back to the condition of the

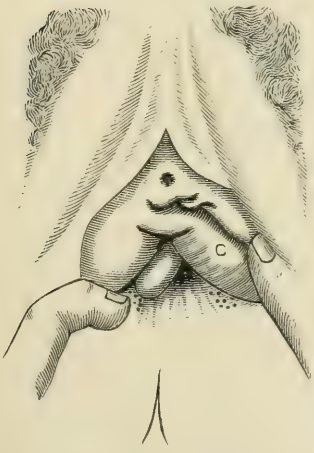
FIG. 256.



The comparison between single deep suture introduced at A, and drawn up, B, and the use of two rows of buried sutures, C.

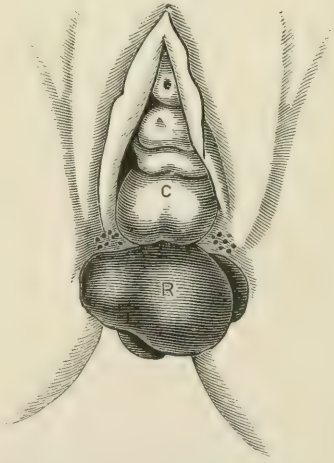
recent tear, the denudation will be made intelligently, the tissues at hand utilized properly without undue sacrifice, and the approximation will be correct and the result satisfactory.

FIG. 257.



Rectal Tear up Septum.

FIG. 258.



Complete Tear, with Prolapse of Anterior Vaginal Wall, C, and of the Rectum, R.

The rent which originally extended high up into the rectum still appears either as a deep sharp indentation, as shown in Fig. 257, or

appears instead as a narrow band extending transversely across the outlet, as seen in Fig. 238. This band, bridging the rectal outlet and stretching from retracted sphincter ends on one side to those on the opposite side, is simply the deep rent in the septum displaced downward by sphincter action and pressure from above, as represented in Fig. 237, C and D: in D is the condition here found, with the zigzag line representing the scar-tissue, extending across between the two sphincter ends, while C represents the original condition of the tear before cicatrization and the action of intra-abdominal pressure assisting the downward displacement. Fig. 258 represents a rarer accident of seventeen years' standing, liable to arise from complete tear, drawn from life. There was here prolapsus of uterus, vaginal walls, and rectum [R].

The various operations devised for the relief of the secondary operation on the complete tear may be classified as bilaterally symmetrical, where a certain pattern is fitted to all cases, the freshening on the opposing sides being exactly alike. On the other hand, starting with Emmet and Freund and ending with Goodell, have arisen a series of rational operations utilizing the tissues as found and restoring them to their natural condition. These are operations extending up the sulci and utilizing the tissue according to the character of the original injury.

Operations for Tear of Perineum through Sphincter.

- Posterior median . . . — Dieffenbach, Simon, Jobert de Lamballe, Baker Brown, Hildebrandt, Hegar.
- Bilateral asymmetrical in the sulci . . . . . — Freund, Emmet, Staude, Goodell.
- Flap method . . . . . — Voss, Duncan, Simpson, Saenger.

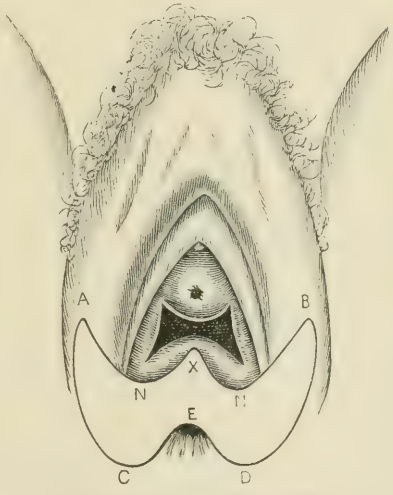
In 1859, Simon urged the correct principles which underlie all successful work, insisting that "a satisfactory union of the parts depended less upon methods and modifications of the operation than a careful attention to the principles, the basis of all successful plastic work." These principles are—good denudation into sound tissue, securing an even surface; exact approximation of the wounded surfaces by sutures well applied and not exerting undue tension. Simon directed to freshen

the surfaces, removing too much rather than too little from the walls of the tear, as in the latter case union will surely be prevented. He prefers the knife as yielding a smoother surface, using scissors to clip off small prominences and for freshening the angle. Union is best secured by a number of interrupted superficial sutures on rectal and vaginal surfaces, closing the tear from the angle downward, when the great deep wedge thus left, extending from the skin perineum inward, is united by means of deep sutures attached to a quill on either side, alternating with superficial knotted sutures.

Hegar's operation is one of the simplest and most satisfactory of the posterior median methods. The shape of the denudation is shown in Fig. 259. The operation is conducted as follows:

Freshening.—The field of operation is exposed upon raising the anterior wall of the vagina by a suitable retractor. The outlying extremities of the new perineum about to be formed are seized by a tenaculum or forceps on both sides, and drawn in opposite directions: thus the points A B and C D in Fig. 259 are caught, and the operation is begun by denuding the small triangle N X M in the figure, point X being exactly the median line of the posterior vaginal wall about two centimeters above the margin of the rectal tear. The removal of this small triangular area prevents the formation of a prominence in the vaginal wall at this point upon passing the sutures, and assists materially in bringing together the freshened surfaces below. It also adds greatly to the thickness of the scar in the recto-vaginal septum, and diminishes the likelihood of the formation of fistule. The incision is now continued from this triangular area in a gently curved line to the points A and B, which are to form, when united, the posterior commissure.

Fig. 259.



Hegar's Operation for Complete Tear.

These points, A and B, lie at the inner margin of the lowest part of the labia majora. From here the line of demarcation is continued along A C and B D, which form the boundaries of the future skin perineum. Care must be taken not to extend the lower part of this incision too far out on the skin surface, as in that case, after union, a roof of overhanging tissue would be built down in front of the anus. The freshening is next continued across the margin of the rectal tear on the

lines C E and D E. This is best accomplished with a pair of scissors. Within the limits of these freshened outlines the tissue is removed by means of a scalpel to the depth of two or three millimeters; the loosened margin is caught with a pair of pincers, and the whole circumscribed flap dissected off from above and from the sides with the flat surface of the knife. Active hemorrhage should be checked by means of artery-clips; when these are removed before passing the sutures, the tissue which has been crushed in their grasp should be snipped off, and the suture will control further bleeding. It is scarcely ever necessary to tie separate vessels. The mistake made by beginners is, in general, too great an exaggeration of the various steps. When the tear extends deeper the form of the denudation must be modified accordingly. The sutures are introduced as shown in Figs. 260 and 261.

After denudation the operator proceeds to pass the vaginal sutures. These are introduced by means of a semicircular needle entering three

Fig. 260.

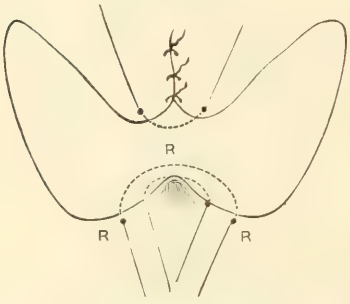
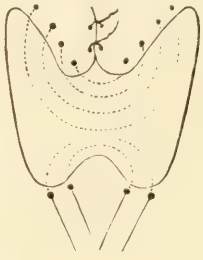


Fig. 261.



Hegar's Operation: method of suturing.

millimeters from the margin of the denudation and carried across to the other side, encircling the whole wounded surface and brought out at a point exactly opposite to that of introduction. As the denuded surface grows broader the operator brings the needle out near the middle of the wound and reintroduces it again, so as not to enclose too much tissue and facilitate the bringing together of the denuded surfaces. After a number of vaginal sutures have been passed the rectal sutures are to be introduced as shown in the diagram. These are also passed three millimeters from the margin of the incision, sweep around to the angle of the tear concealed by the tissue, brought out and reintroduced, appearing on the rectal surface at a point opposite to that of entrance. The free ends of these sutures hang out of the rectum, and, as wire is often painful and difficult to remove, carbolized silk or catgut is preferred; these require no further care. Rectal and vaginal sutures are now introduced alternately, sutures enclosing less tissue

varying with deep sutures, introducing both with careful attention to the amount of traction exerted on the tissues. On the vaginal side it is necessary to introduce a number of superficial sutures accurately approximating the mucous membrane. The stitches are knotted as a rule when introduced, and only when tension is considerable is it necessary before bringing up and tying the deep sutures to pass one or more relief sutures extending a shorter distance into the tissue. In this way the denuded surface is gradually narrowed down, and the operator holds in view an exact appreciation of the effect of each separate suture. When, finally, the whole surface of denudation in rectum and vagina has been closed, the perineal sutures are introduced; while these are being brought together the limbs must be approximated to diminish the tension. The important point to be borne in mind in passing the sutures is that the whole freshened surface should be caught up by the sutures, and so accurately brought together that no spaces shall remain between the suture rows. After conclusion of the suturing the blood which has collected between the lips of the wound must be pressed out by the fingers, and the vagina, rectum, and perineum thoroughly disinfected. It is proper then to divide the sphincter ani muscle subcutaneously or make an open wound by a median or two lateral incisions in its posterior margin. The favorable effect of the division of the sphincter, according to Hegar, rests less upon the fact that tension is taken from the rectal stitches than that feces and flatus for the first few days after the operation are thus permitted to pass freely away without distension or traction upon the rectum. The advantage of this triangular method of Hegar is, according to his estimate, its great simplicity. The form of the surface freshened is most favorable for plastic substitution of the uninjured perineum, which affords a union from opposite sides with the least possible tension and the least loss of the tissue: and, further, it is applicable in all cases.

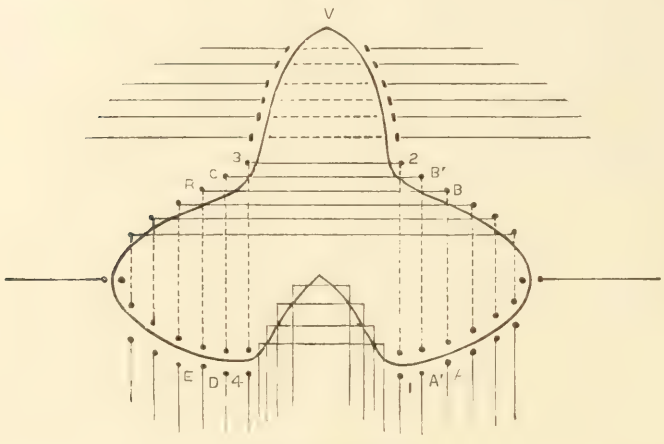
We must urgently dissent from Hegar's opinion as to the necessity of dividing the sphincter muscle, which will not be necessary if the sutures are carefully passed with a view to bringing together the denuded sphincter ends, as described in the operation for the recent injury.

Hildebrandt's Operation is one which has long been widely and successfully practised. It represents important points of difference from Hegar's, particularly in the method of passing the sutures. He divides the operation into two steps—the freshening and the suture.

The Freshening.—After a suitable preparation the patient is brought into position on the table, the parts exposed, and the peculiarities of the case carefully studied. The field of operation is kept in view by the hands of a skilled assistant, which is preferable to the use of the tenaculum or a Simon's speculum. The denudation must frequently

not be limited to the scar-tissue, but must extend even to a considerable distance beyond the scar-limits and well on to the labia majora. With these guiding principles, according to the size and shape of the tear the field of denudation is mapped out with the point of the knife in the shape somewhat approaching that shown in Fig. 262. Be-

Fig. 262.



Hildebrandt's Operation.

yond the broad denudation on either side a triangular figure is continued up on the posterior wall of the vagina, with the intention, after approximating the two sides of this bilateral symmetrical figure, to bring about union in such a way as to secure a gentle curve from the cervix uteri down the vagina and up over the newly-formed perineum. The whole figure should be made sufficiently extensive to give breadth and strength to the new perineum.

Hildebrandt prefers the knife for the freshening throughout. At the margins of the denudations the point is entered vertically into the tissues, while the removal of the flaps on either side follows by means of long-drawn cuts with the flat surface of the blade parallel to the tissue. Hildebrandt has placed before himself as his chief object in the restoration of the perineum the formation of a deep perineal wedge gently sloping up on the posterior vaginal wall to the cervix, using every effort to avoid a simple skin union.

The Suture.—In passing the suture the important points to be borne in mind are—

1st, that these enter in three directions—on the vaginal side, the rectal side, and on the side of the skin perineum;

2d, that the deep sutures should only be passed from one of the two last-named directions, and superficially from the other.

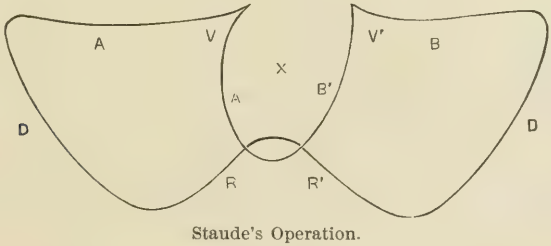
Hildebrandt prefers iron wire for his suture material, and the

introduction of all sutures before twisting any, as affording a better means of judging effect and the proper depth for the insertion of those which remain. The wounded surface must be kept absolutely clean while bringing up the sutures. The utmost importance is placed upon the after-treatment. The daily catheterization is to be avoided as far as possible, and the wound washed with a solution of salicylic acid in water. Moderate movements of the bowels are to be secured by daily injections. The best posture for the patient is the side position. The perineal sutures are removed from the sixth to the eighth day, and the sutures at the sphincter and in the rectum when they begin to cut; and the vaginal sutures from the tenth to the fourteenth day.

STAUDE'S OPERATION.—One of the most satisfactory of all methods for uniting an old complete tear of the perineum which has extended into the vagina beyond the apex of the columna is that recommended by Dr. Staude of Hamburg. The important steps are as follows:

The Denudation.—After separating the labia, and discovering how far on either side of the columna the tear has extended, the operator begins to freshen the tissue at the point where the scar extends deepest into the vagina. The freshening is extended down toward the skin surface of the perineum somewhat beyond the limits of the visible scar, and is then carried up on the opposite side of the columna in like manner until on both sides of the perineum two triangles are formed, as shown in Fig. 263. The apices of the two triangles formed are in the

FIG. 263.



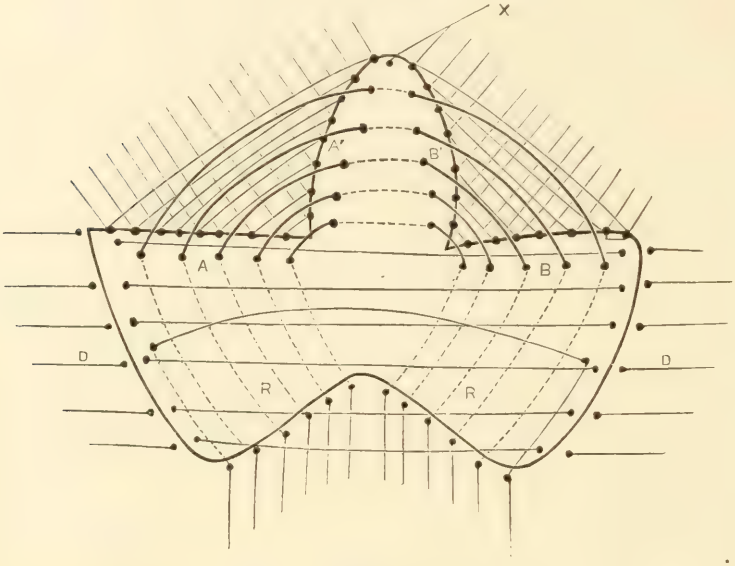
Staude's Operation.

sulci of the vagina, pointing toward the cervix; the sides are on the vaginal and rectal surfaces, and the base at the skin perineum. Over this figure the columna hangs denuded on its sides, but drawn down and attached by the contracted scar-tissue beneath; this must be so far separated beneath that its point can easily be brought down to the skin, and the denudation continued beneath and around its margin, when the parts are ready for suture.

The Suture.—Sutures of carbolized silk are used, beginning at the apex of the tear in the vagina, uniting the margins of the columna to the freshened border of the vaginal wall on either side by a series of superficial sutures, until the apex of the rectal tear is reached, when the

principal sutures are passed from the rectal surface, entering on one side, embracing nearly the whole depth of the denudation, catching the under surface of the loose columna, re-entering on the lateral wall, to reappear at a point corresponding to that of entrance, as shown in Fig. 264.

Fig. 264.



Sutures in Staude's Operation.

Goodell's Operation.—Prof. Goodell has for some years past made use of an operative procedure similar in character to that just described,[1] which has yielded in the writer's hands, as well as his own, excellent results. The important features of the method are the following:

The Denudation.—Introducing two fingers into the bowel, the overlying tissues are put on the stretch, and with a pair of curved scissors the tissue is cut off the rectal margin of the rent in a narrow ribbon, including at the same time the retracted ends of the sphincter, which are hooked out by a tenaculum and thus brought within reach. This denudation is continued from side to side and back again, and carried simultaneously upward toward the vaginal surface and outward on to the skin surface of the perineum. The two figures on opposing sides are made exactly similar. Just above the apex of the tear the vaginal mucous membrane is caught with the forceps, and, instead of cutting away the tissue, it is dissected off in the form of a triangular flap, to be utilized shortly in the formation of the perineum.

The Suture.—A curved needle armed with silver wire is entered on

[1] *Lessons in Gynecology*, Wm. Goodell, Philada., 1887.

a level with the lower margin of the anus, about half an inch away from it, and carried with a sweep around through the recto-vaginal septum, remaining completely buried until it reappears at the corresponding point on the other side. If the rectal rent is not too deep, one or two additional sutures may be passed in this way, entering the perineum at points successively higher. The remaining sutures should be introduced on the skin surface of the perineum, emerging on the raw surfaces of the denudation near the vaginal margin, transfixing the flap dissected up from the posterior wall of the vagina on its under surface, entering the opposing denuded surface on the lateral wall near its vaginal margin, and reappearing on the skin surface of the opposite side at a point corresponding to that of the original entrance. It is important to avoid piercing the undenuded surface of the vaginal flap. The sutures which transfix the flap must, when twisted, be invisible, excepting on the skin surface of the perineum. In no case has a flap ever sloughed or failed to unite.

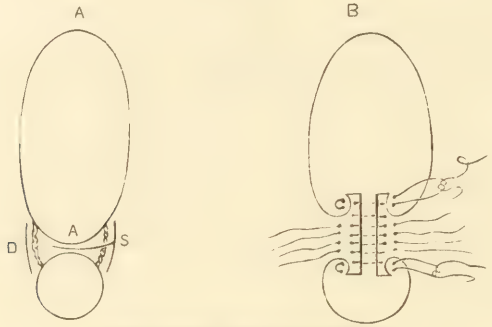
In this as in the other operations the success depends largely upon the after-treatment. The patient's urine should be drawn as often as necessary. Opium should be given when the tension of the sutures is painful. The wound should be kept clean and dusted daily with iodoform. Food should be restricted. The bowels are to be opened on the third day by an aperient, preferably castor oil or Epsom salts, administered every four hours until a motion is secured. On the eighth day, after securing a movement, the stitches are removed; after this a disinfecting vaginal douche is given twice daily. The patient should remain in bed for at least two weeks with her knees bound together. She is not to be allowed to walk about until the end of the third week.

Flap Operations.—When a patient has undergone a series of unsuccessful operations with great loss of tissue, the best method of treatment is repair of the perineum by splitting the recto-vaginal septum and forming flaps, which are drawn up toward the vagina and down toward the rectum, and the tissues brought together from the opposing sides by transverse sutures. This method of operating for complete tear of the perineum has attained its fullest development within the past few years. Already foreshadowed by Langenbeck's method of perineo-synthesis, it has remained for more recent operators to develop its full details and elevate it to a scientific position. Thus Saenger of Leipzig has recently carefully elaborated the whole subject and given it its proper status historically and practically. He has shown that Prof. Voos in Christiania has well described this method by two simple but excellent diagrams in the *Norsk Magazin for Laegevidenskaben* (2 Reihe, 24 Bd.). (See Fig. 265.)

In Fig. 265, taken from Saenger's work describing Voos' method, the larger oval above (Fig. 265, A) represents the vaginal outlet, and

the small circle below a cross section of the rectum. The space between the oval and the circle represents the recto-vaginal septum. The operation is carried out by splitting the septum transversely and suturing on the vaginal and rectal sides separately; the margins of the tear then form a broad skin perineum where previous to the operation

FIG. 265.



Voos' Method, taken from Saenger.

none had existed, and this is brought together by means of the four transverse sutures shown in the right-hand diagram. The operation thus simply figured and described contains all the essentials of the best conducted flap operation. Voos reported two cases, after one of which a small recto-vaginal fistule remained, as was the case in one or two patients of Nicolaysen's, who operated according to an original modification of this method.

The flap operation has long been in use in the city of Edinburgh, dating from the time of Dr. John Duncan, and has been practised for many years by Prof. A. R. Simpson, as described in Hart's and Barbour's *Manual*. The figures which are here reproduced (Fig. 265, A, B) are taken from manuscript given the writer by Dr. Saenger of Leipzig, and will elucidate the text as we describe this method.[1] After proper exposure of parts an incision is made from the point S, splitting the sharp border of the tear, bridging over the rectum, extending into the labia on either side. The second incision is carried from the lower extremity of the nymphæ parallel to the vaginal orifice, and meeting the outer extremities of the transverse incision at S. This vertical incision is continued on to the margin of the torn sphincter. The incisions on both sides are symmetrical; they are continued deeply into the tissues, and the flaps thus marked out are dissected carefully up on both sides and brought together.

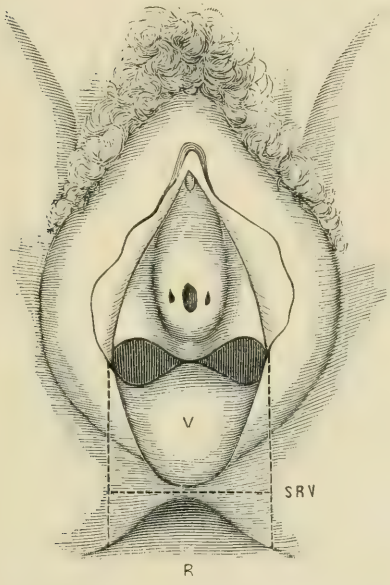
The upper flap is thus made to form the floor of the vagina, while the union of the margins of the lower flap closes the tear in the rectum. Silver wire or silk sutures are used on the vaginal surfaces and left long.

[1] *Volkmann's Sammlung*, No. 309, p. 2177.

Catgut is used on the rectal surface and the threads cut short. In this way the rectal and vaginal canals are restored to their natural length. The final step consists in bringing together the triangular raw surfaces on either side extending in from the skin perineum, thus restoring the perineum in the form of a deep wedge. This is usually brought about by two strong, deep sutures of silver wire and a series of superficial sutures between, to bring the skin margins into more accurate approximation.

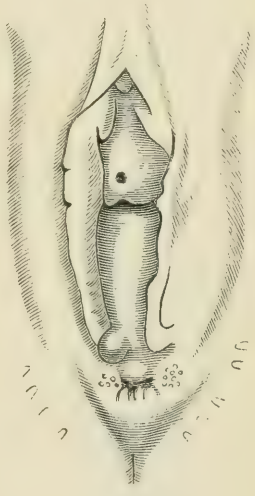
Saenger advises a fine scalpel for splitting the septum instead of scissors, as with this the danger of penetrating either rectum or vagina

Fig. 266.



Flap Method for Complete Tear of the Perineum, taken from Saenger.

Fig. 267.



Complete Tear operated upon eleven times.

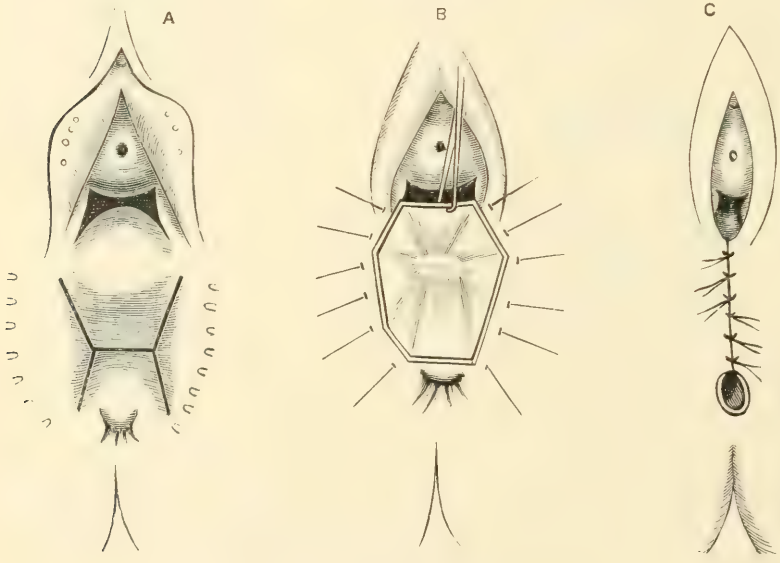
with the point is less. The deeper the tear the deeper must the knife enter the septum. The incision through the septum is continued outside to the right and left in a horizontal plane to a point vertically below the terminal extremities of the nymphæ, as seen in the diagram. Then with the scissors from this point an incision is made vertically downward on both sides of the torn ends of the sphincter. In this way an H-shaped figure is formed, with the lower bars shorter. The two folds form a vaginal and a rectal flap. These are caught and further separated by forceps, and by a careful use of the scissors separated by continuing inward the external incisions.

If left to themselves, the rectal and vaginal flaps thus formed make a concave arch looking toward rectum and vagina respectively. These

must be caught in the middle by forceps and carried downward and upward, so that the whole wounded surface comes to be in two vertical planes. (See also Fig. 268, B and C.) From three to six silver wires are passed—first, one through the middle, the others on either side of this —and the opposing surfaces brought accurately together; and further, according to Saenger's plan, all the sutures are laid from the skin surface of the perineum, and the vagina and rectum not sutured separately, or at most but few superficial sutures are passed. The bowels should be moved on the third day after the operation and every second day following this. The wound surface is kept clean and sprinkled with iodoform powder. The superficial sutures are to be removed on the seventh day, and the silver wire on the fourteenth day. Saenger states that the results are so perfect that the perineum may often with difficulty be distinguished from the perfectly normal.

Fig. 267 was cured by this means by the writer after ten previous operations. All available tissue had been sacrificed, and the position of the perineum was occupied with a deep cup-shaped depression

FIG. 268.



Method of Repair adopted in previous cases.

floored with cicatricial tissue. Perineal sutures only from the skin margin were introduced here after making the flaps described above. The result was excellent. The method is shown in Fig. 268.

Relaxation.

Under this title we proceed to describe the treatment of injuries of the pelvic floor and perineum characterized in the secondary stage by a lax, open vaginal outlet, with more or less tendency to prolapsus of the structures above, shown by the formation of rectocele, cystocele, and prolapsus uteri, or more rarely by the strain of other muscular fibres endeavoring to do duty in closing the relaxed outlet in place of those normally guarding it, but sacrificed by the injury.

We wish to assert again that laceration of the perineum not involving the sphincter has but rarely any significance beyond its association with relaxation of the pelvic floor or vaginal outlet. The destruction of tissue or tear of the fibres entering into the superficial external perineum, as seen in Fig. 228, is not productive of harm unless associated with the deeper separation of the levator fibres controlling the vaginal outlet. The natural and frequent association of the superficial with the deeper injury has led to the serious error of attributing the consequences of the latter invisible injury to the former, which can always be seen.

Growth of Perineal Operations.—The history of the growth of perineal surgery is one of interest. Beginning at the most accessible parts with a simple horseshoe denudation on the outside, on the vulva, designed to form a barrier in front of the outlet to bear and keep back the weight of structures tending to prolapse, operators gradually extended their work up into the vagina, fitting upon its posterior wall all conceivable patterns which could be drawn upon paper, from the horseshoe on the outside to the figure of Simon, crossing the outlet, and to the great triangular denudation of Hegar, extending from the vulva up to the cervix on the posterior vaginal wall. This growth of a perineal operation from a simple transverse union of the labia across the outlet, to an operation embracing a great width of the posterior vaginal wall from perineum to cervix, has been brought about by the realization of the necessity of in some way caring for the rectocele, disposing of the lax tissue in the posterior vaginal wall, and preventing it from prolapsing over the bridge of union formed by the operation.

It will be observed in consulting Fig. 269 that, however widely various operations may differ in form, they all agree in one important point bearing critically upon our remarks on relaxation, which results in their having the greatest average breadth of denudation at a point lying in the position of the outlet as described. Here the union is strongest, and here is the common cause for the successful results attending these different operations.

The mechanical effect of all posterior median operations is the same. In Fig. 270, A, is represented a lax outlet with a prominent rounded

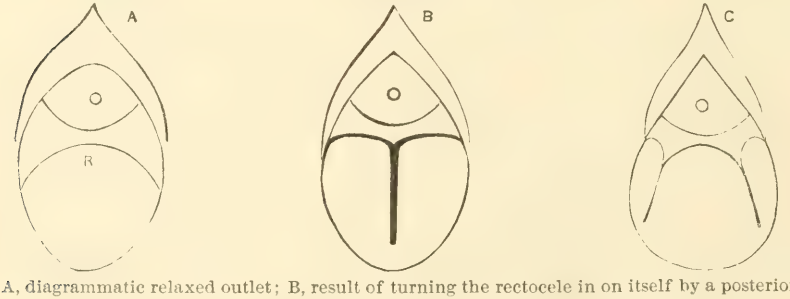
rectocele filling the lumen of the dilated vagina. The effect of turning thus in upon itself in the posterior median operation is shown in B by the strong cicatrix in the middle line, while in C is shown one of the effects of utilizing the sulci and interposing two lateral bars of scar-tissue according to the more rational method to be described.

FIG. 269.

Superimposed Diagrams of Fritsch's, Hegar's, Bischoff's, Simon's, and Emmet's Operations.

It has remained for more recent times to develop the methods of operating, utilizing the sulci, and in place of inverting the rectocele on itself, and, gaining support simply from a median bar of scar-tissue, to make the denudation on both sides of the rectocele, catching up the lax

FIG. 270.



A, diagrammatic relaxed outlet; B, result of turning the rectocele in on itself by a posterior median operation; C, union in the sulci by a method similar to Emmet's.

fibres hanging from the pubic rami and bringing them back to their former attachments, as shown in Fig. 264, uniting the parts where they have been torn, and interposing as well two lateral bars of scar-

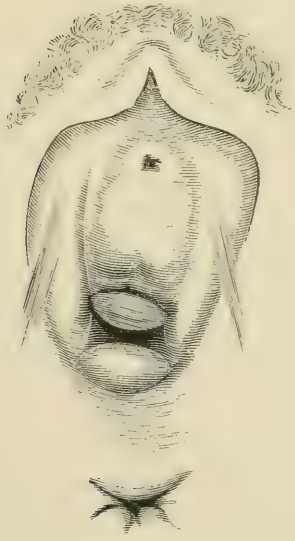
tissue (Fig. 270, c). The operation of Bischoff, sparing the posterior median surface of the vagina, distinctly foreshadowed these methods, his object being to dissect off a flap, make a broad denudation on the sides, raise the flap to a higher level, reattaching it on each side, so that it continued to form the floor of the vagina.

Martin of Berlin fully appreciated the principles involved when he invented his operation, insisting upon the advantages of using the sulci for denudation and support, instead of the posterior median surface of the vagina.

It has remained for the genius of our own Dr. T. A. Emmet to devise the most perfect of all natural methods of repair for these cases of relaxation—a method which, utilizing the sulci on either side of the columna, and by a few stitches, passed as shown in Fig. 243, lifting high up and putting away the rectocele, and by a single gathering stitch around the denuded tissues at the outlet bringing all together and closing the whole wound.

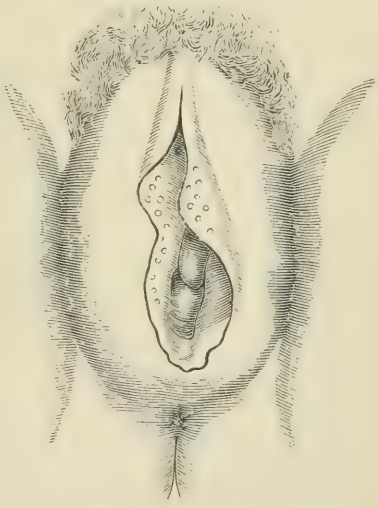
As long as the dictum prevails that the functional value of a perineum is in direct ratio to its depth on the skin surface, just so long

FIG. 271.



Relaxed Outlet.

FIG. 272.

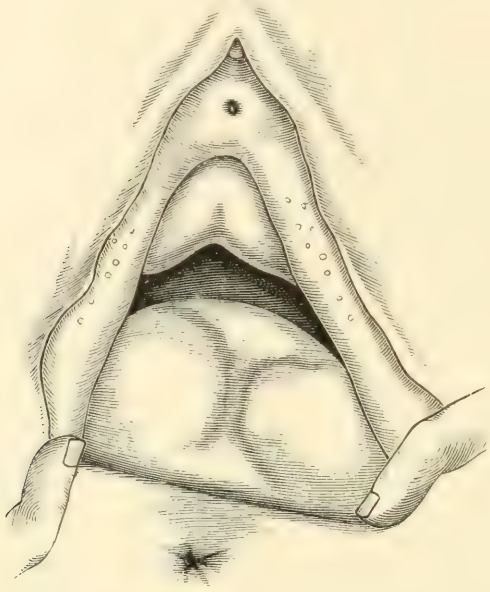


The Same, at Rest.

will many of the worst cases applying for relief continue to carry their burden and suffer. The rule is the opposite. The functional activity of the perineum is in inverse order to its depth on the skin surface. Fig. 271 shows just such a relaxed perineum drawn from nature, and its utter uselessness is shown by applying the test described, exhibited in Fig. 273.

The perineum of Fig. 231 is one of unusual depth, and in addition to this fact its nature may already excite suspicion from the few wrinkles crossing it, as well as the tip of the rectocele seen peeping over the fourchette, which is uninjured. The backward displacement of the anus, no longer lying pinched up in the cleft, is also remarkable. Upon hooking a finger in the outlet on either side, pulling backward

Fig. 273.



Test showing Relaxation of the same Outlet.

and outward and carrying the fingers toward the pubic rami, as shown in Fig. 273, the lax condition of the outlet is exhibited beyond a cavil by the great tendency of the whole posterior wall to roll out and the large dilated outlet exposed. In this case the writer was able to introduce his fist without stretching the parts.

Fig. 234 shows, as described, a picture often seen upon attempting in this manner to evert a lax outlet, and in Fig. 235 is shown the result of taking the semi-prone position when the posterior vaginal wall, losing its normal support, and no longer forced into contact with the anterior wall by the intra-abdominal pressure, now drops back, leaving a large opening, allowing the air to enter and escape freely with the respiration of the patient. In an uninjured outlet such an appearance as is shown here is never seen.

Of the posterior median operations, Hegar's is the best, and is described as the type. This operation has the great merit of simplicity of device, both in the denudation and the suturing, as well as

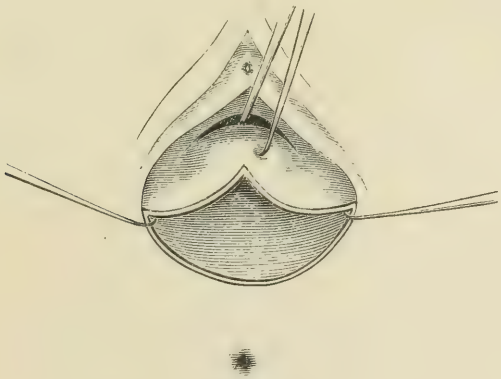
efficiency in narrowing the dilated vaginal canal and affording a firm barrier of scar-tissue, often effectually preventing any further prolapsus.

The form of the figure is a simple triangle (Fig. 269) extending from the vulva at its base to its apex at the cervix. The size of this triangle, its length, and its breadth vary with the length of the vaginal canal and the size and laxity of the outlet. For average cases this is from two to two and a half inches in breadth by two and a half in length, extending even to three inches in breadth by three and a half in length.

The day before the operation the patient is to be prepared by having her bowels thoroughly opened and the parts well washed with a disinfecting solution.

Hegar's Operation.—The patient is placed in the lithotomy position. Four to five assistants are needed—two to hold the legs flexed and the tenacula exposing the parts; the third man hands the instruments; and the fourth administers the anæsthetic. The first step is to fully expose the field of operation. To this end a stout tenaculum is caught in the posterior lip of the cervix, which is inverted and drawn downward and at the same time lifted upward, as seen in Fig. 274, where the

Fig. 274.



Hegar's Operation, foreshortened.

figure of denudation is the same as shown in Fig. 269, being here represented as foreshortened. The other tenacula are fixed in the lowest part of the labia majora, a little more than an inch from the perineal raphé on either side, and drawn forcibly to both sides. In this way the field for operation is exposed.

The base of the triangle runs in a curve across the posterior commissure, as seen in Fig. 269. From the two extremities of this line the incision extends up on each side of the posterior vaginal wall, meeting in a sharp angle just below the cervix, as seen in the figure.

The first step is to begin by starting an incision behind the cervix, and extending it down the sides, as shown; a flap large enough to be held in the fingers is separated at the apex and pulled downward, and with the fingers and a scalpel the rest of the flap is freed, making a triangular section of the posterior wall. The rectum is protected when the recto-vaginal septum is very thin by introducing the finger, while denuding, into the bowel and everting it. Any large, actively-bleeding vessels must be caught and held by artery-forceps.

When the denudation has been made thus far, leaving a large triangular flap, involving the whole thickness of the vaginal wall, in the operator's hand, the curved incision sweeping across the posterior commissure connecting the two lateral incisions follows, and the whole flap is removed. The whole denudation can be made very rapidly, occupying usually not longer than from three to five minutes. After this freshening the surface is smoothed of all undenuded islets and irregularities by scissors curved on the flat. The wounded surface is then carefully irrigated and larger bleeding vessels tied with catgut.

Suturing.—Passing the sutures is the last step. Of prime importance is the passage of a sufficient number of deep sutures underlying the whole denuded area, in order that no pockets be left for the accumulation of blood and secretions. These sutures should be introduced at a distance a little more than a third of an inch apart, and between every two of these deep sutures a superficial suture uniting more exactly the borders of the wound and preventing the entrance of vaginal secretions.

The union of surfaces begins at the apex, and as soon as several deep sutures are laid they are drawn up and tied. By this means an exact account is kept of the work being done by each suture, and the others which follow may be introduced to correct any defect in the apposition, which may also be assisted by sutures between the deep and the superficial extending halfway to the depth of the wound.

For these vaginal sutures silver wire is to be preferred. When all the sutures have been thus entered on the vaginal surface a few perineal sutures, penetrating about a half inch, will close the wound. For these sutures silk is preferable.

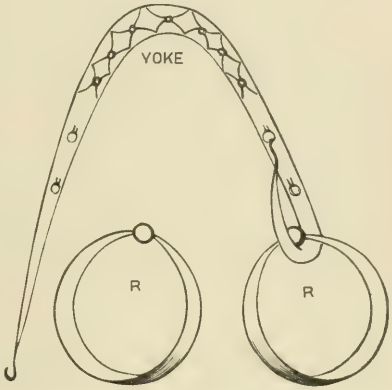
Emmet's Operation.—In marked contrast to all previous operations, of which Hegar's just described stands as a type, is the operation for relaxation devised by Dr. T. A. Emmet. Its peculiarity lies both in the denudation, which is posterior median in front and bilateral on either side of the columna, extending into the right and left sulci, and in the sutures, which are so planned as to lift the prolapsing outlet up to the pubic arch, uniting the parts in their natural position and preserving the normal H-shape of the vagina. The object of the operation is to carry the denudation up the sulci on each side of the rectocele or columna deep enough to expose the fibres connecting the levator ani and

rectum (Fig. 243, A), and by suture bring the fibres on the lateral wall and rectum into contact and secure their union in this position.

The procedure is difficult to describe, and may perhaps be better exhibited by means of diagrams taken from cases.

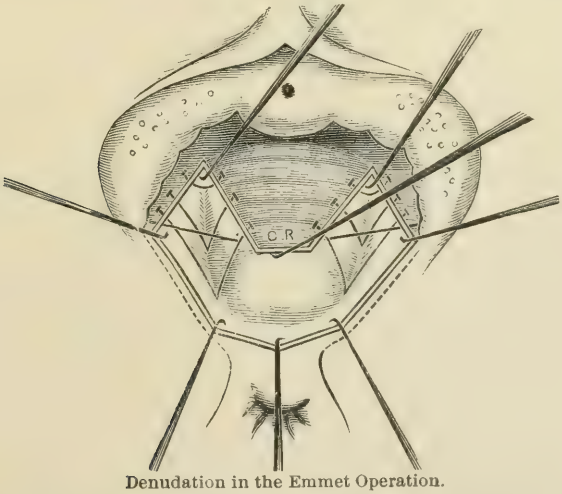
After the preparation of the patient customary in other procedures, seeing that her bowels have been thoroughly moved, repeated careful cleansing of the parts, and abstinence from the customary meal immediately preceding the operation, she is anæsthetized and lifted on to the table; the clothes are drawn well up under the back, and the hips brought to the edge of the table over the perineal pad. The rings R R of the halter (Fig. 275) are then slipped over the legs and carried up above the knees, and the thighs flexed on the abdomen. The neck-yoke of the halter is then pulled through the ring of one side and snapped into one of the rings on its own inner side; it is then carried under one arm up and across the back of the neck, and down over the other shoulder, to be snapped in the ring holding the thigh up on the opposite side. The halter thus placed pulls the knees upward

FIG. 275.



Simple apparatus for holding thighs flexed on abdomen, taking the place of more expensive cumbersome crutches; it is called "Beinhalter," or "leg-holder."

FIG. 276.



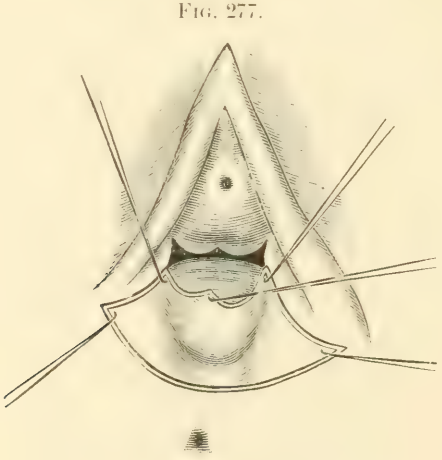
Denudation in the Emmet Operation.

and outward, and does away entirely with the clumsy cross-bar between

the knees common to other halters or crutches. The manner of passing it under the arm on one side and over the neck on the other prevents also pressure upon the jugulars. The principal point in the use of the halter is to leave no slack, pulling the yoke up tight until both thighs closely hug the abdominal walls.

The irrigator is hung on the wall near by, and the discharge-tube held in the hand of one of the assistants; another assistant stands by the other leg, and a third places himself at the right hand of the operator, with all the instruments close by, ready to hand them as needed. It is my custom in my hospital to have a fourth to receive any instrument soiled with blood, wash it at once, and return it to the pan, or if not wanted to put it away. The operator and assistants having all thoroughly washed their hands before beginning, the assistant at the right leg begins by playing water freely on the parts, which are douched, washed, and cleansed for the last time.

FIG. 277.

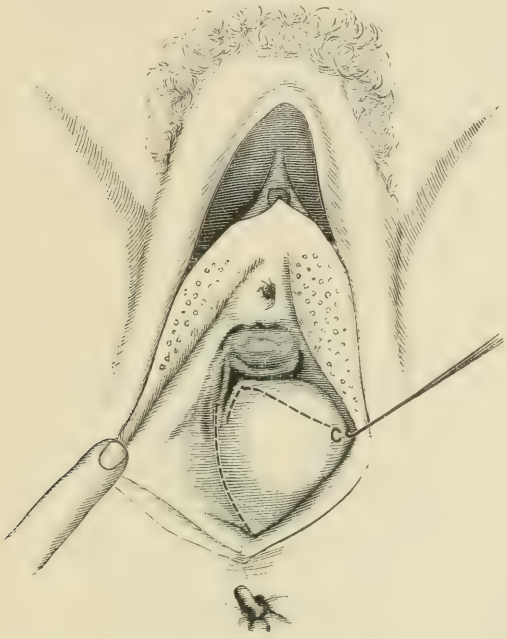


Denudation in the Emmet Operation.

The first object of the operation is to effect a denudation like that seen in Figs. 276 and 277. The labia are separated, and a tenaculum fastened into the crest of the rectocele (Fig. 276, C R). This is pulled well over to one side, exposing the side of the rectocele, as seen well in Fig. 278, then hooking another tenaculum into the tissue near one of the caruncles at the upper part of the outlet. This is drawn out in the opposite direction, and a triangle is formed by the natural drawing of the tissues into the sulcus, as shown in Fig. 279; seen also in Fig. 280, B C R and F E R. Care must be taken not to insert the tenaculum on the side, out on the vulva, as the traction then has a tendency to form a triangle pointing at the pubic bone, the point of greatest resistance at the outlet. The denudation of such a triangle would result, after

suturing, in rolling the outlet outward more than ever—an accident which has actually occurred. This false point is shown at x, Fig. 279, and on the lateral wall near the outlet in Fig. 278.

Fig. 278.



Crest of Rectocele drawn to the left to expose the right sulcus for denudation.

The extent of the denudation up into the sulcus varies with the amount of slack in the posterior vaginal wall which is to be taken up. In a simple relaxed outlet, upon drawing the crest to the opposite side and drawing the caruncle down and out, the apex of the triangle spoken of is brought down in a direct line with these two points, and the denudation, if carried straight across, will, upon releasing the tension, then form a distinct triangle in the sulcus.

The area above defined, seen in Figs. 276, 277, 278, 279, and 280, must now be denuded. The assistants hold the tenacula, exposing the field for denudation, while the operator begins to take long sweeping cuts with scissors, catching up a little tissue near the crest of the rectocele with a tenaculum, and cutting with the scissors straight across to the other tenaculum, then back again, and so on, often removing the whole surface in one continuous strip, held by the fingers as soon as it is long enough to pick up.

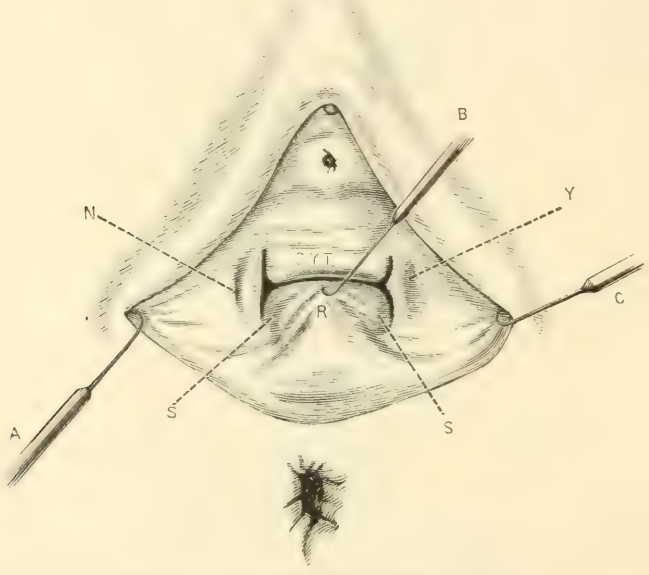
If the outlet is very lax and the vaginal canal above greatly distended, it will be necessary to continue a broad area of denudation farther up into the sulcus. The removal of tissue should extend down

through the thickness of the vaginal wall and at the bottom of the sulcus deep into the tissue below.

When the denudation on one side has been completed in this way, it is then continued on the other side in a similar manner by drawing the crest of the rectocele in the opposite direction and catching a caruncle on the level to which it is desired to raise the outlet, and denuding the triangle thus exposed.

It must be borne in mind that this is emphatically an inside operation, and the addition of any extensive denudation reaching out upon

FIG. 279.



Showing Sulci up which Denudation extends.

the labia builds up a cumbersome structure, the larger part of which is an unnecessary, useless addition. The truly effective part is that which lies just under the pubic arch and inside the vaginal outlet.

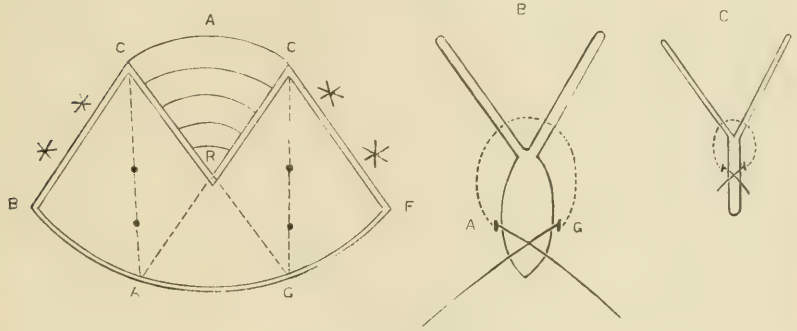
If after thus denuding the triangles in the sulci, seen in Figs. 276, 277, and 278, any part of the tissue in front of the rectocele included in the area A R G, Fig. 280, remains undenuded, this must also be included, so that the line B A G F sweeps from the caruncle B on the right side down to the fourchette and up to the caruncle F on the left side.

When the relaxation is due to separation of the fibres chiefly on one side, as in Fig. 281, where most marked in the right sulcus, the denudation should extend deeper on that side, giving a figure like that in Fig. 247, A.

The Suture.—The system of suturing devised by Dr. Emmet is as

skilfully planned as the denudation, succeeding by a few stitches properly applied in lifting the lax floor and restoring the dilated outlet in

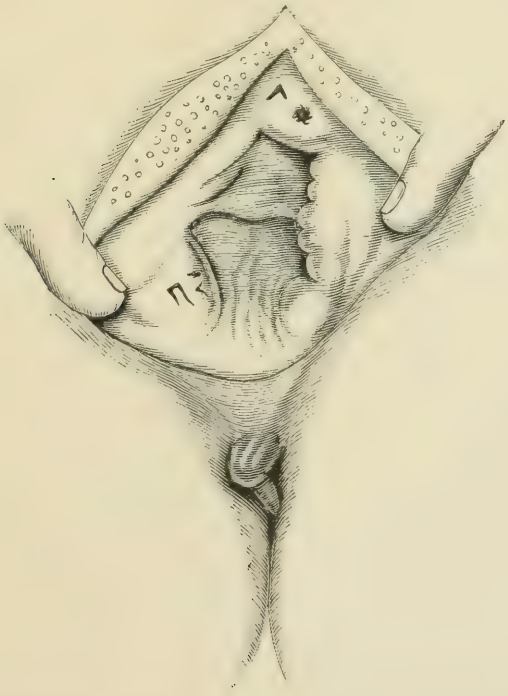
FIG. 280.



Diagrams of Emmet's Operation.

a manner which appears to one seeing the operation for the first time as little less than marvellous. Silver wire and silkworm gut are the

FIG. 281.



Relaxation, separation of fibres, principally on right side.

best suture materials. Each suture should be about eight inches in length: from ten to twelve are ordinarily used. They are best carried

through the tissues into place by means of a straight or a curved needle armed with a loop of silk acting as a leader.

Inasmuch as it is the design of the operation that each suture in the vagina should exercise a definite amount of lifting power, it is obvious that the end will not be reached by simple transverse union, which, it is true, narrows the outlet, but does not elevate the prolapsing tissue.

Vaginal Sutures.—Upon exposing one of the triangles extending into the sulcus, the first stitch is passed transversely under the apex of the triangle (Fig. 276). This may be tied at once, closing the apex. The next stitch enters on the rectocele close to the margin of the denudation, about a fifth of an inch below the first, and is carried in a direction toward the operator, and brought out at the bottom of the sulcus at a point much lower down than the point of entrance, as seen in Figs. 247 and 276. The needle, thus brought out at the bottom of the sulcus, is re-entered near the same point, and carried up away from the operator, reappearing on the lateral wall of the vagina close to the margin of the denudation, at a point as far above the appearance at the bottom of the sulcus as the starting-point on the other side of the wound. Usually not more than three or four sutures are required in the vagina on either side.

While care must be exercised when passing the needle down the side of the rectocele not to injure the rectum or allow it to appear on the vaginal surface, equally great care must be taken to cause the needle to take a deep sweep in the lateral walls of the vagina, with the idea of catching and holding up in their loose bed of tissue the relaxed fibres hanging at the sides, as insisted upon elsewhere.

If the resistance in all directions were precisely equal, the result of drawing up any one of these sutures would be to bring the three points of the triangle, made by the suture in the vaginal tissue, equally together toward the centre of the figure of the triangle; but the genius of the operation depends upon the fact that the whole resisting power lies here in one place, along the lateral wall marked * * in Fig. 280, A, where the tissues are attached to the pubic rami, and up to this place the lax tissues are lifted up and fastened.

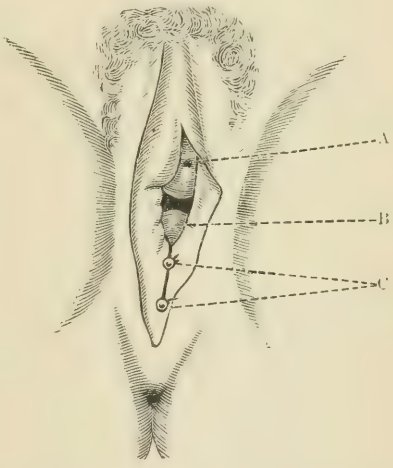
In Fig. 280, B and C, is seen the effect of drawing up and tying these vaginal sutures, the most remarkable change observable being the fact that the wide area in front of the rectocele is almost completely disposed of by vaginal sutures alone, leaving nothing more than a relatively small depressed area brought together by one or two outside sutures.

The Crown Suture.—But two or three sutures are passed from the outside, and in simple relaxation these are never upon the skin surface, but just within the posterior commissure. The most important stitch,

called the crown suture, is entered on one side, as shown in Fig. 280, B, a short distance on either side of the centre of the line F B, and carried across the apex of the tear at its outer angle, as seen in Fig. 280, B, made to emerge on the lateral vaginal wall, transfix the point of the columna, to re-enter and reappear at the point corresponding to that of entrance. The effect of drawing this suture is to purse up the remaining exposed surface and lift the posterior margin of the denudation up to the outlet, which affords a fixed point after the tying of the vaginal sutures, as seen in Fig. 280, C. If after passing this stitch there is any pouting of the margins of the wound between the sutures, they should be very accurately approximated by one or more sutures passed superficially, and the same care should be taken to secure exact coaptation of the margins in the vagina.

The completed operation is seen in Fig. 282, where silkworm gut was used and shotted. The lower shot here clamps the crown suture, and the upper one more superficial. The silkworm-gut sutures may be bunched together and cut long, so that the separate sutures can be grasped at once at the outlet, greatly facilitating removal. The external sutures should be removed in eight days, while the internal may remain two weeks or even longer, to be taken out after the patient has begun to go about.

FIG. 282.



Appearance of Parts after Emmet's Operation: A, urethra; B, nymphæ; C, two shotted sutures externally.

The after-care of the patient is cleanliness, douching if there is discharge, and drawing the urine until she is able to pass it herself. The bowels should be opened on the third or fourth day. It is better for the patient to remain at least two weeks in bed to ensure firm union before the parts are subjected to the strain of the erect posture, but she need not at any time be confined to one posture, being allowed to change her position as often as she wishes. Opium is rarely necessary, and frequently there is not at any time the slightest sensation of pain after awakening from the anæsthetic.

To avoid the dangers of catheterization, I instruct my nurses to cleanse the meatus before passing the catheter, and keep a number of glass catheters continuously in a jar containing a weak bichloride solution. After use they are cleansed at once and dropped back into the solution, resting on some cotton in the bottom of the jar.

This operation requires judgment and experience to adapt it successfully to all cases, but it is, in the opinion of the writer, so far superior to all other methods that no pains ought to be spared to master its peculiarities and, if possible, study a number of cases in the hands of a competent operator.

THE TREATMENT OF OVARIAN AND OF EXTRA-OVARIAN TUMORS.

By WILLIAM GOODELL, A.M., M.D.,

Philadelphia.

Extra-ovarian Cysts.

There is a class of tumors which, while not ovarian, lie so near to the ovary as often to involve it, and usually need precisely the same treatment as cysts of that organ. In their extirpation the ovary is almost always also involved. This close anatomical relationship makes it needful to describe them in conjunction with ovarian tumors. They comprise cysts of the parovarium, or of the broad ligament, cysts of the oviducts, or Fallopian dropsy, and cysts of the terminal vesicle of the oviduct, often called the hydatid or vesicle of Morgagni.

Cysts of the Parovarium.

These are formed from the dropsical distension of one of the tubules of the parovarium, or organ of Rosenmüller, which lies between the folds of the broad ligament and between the ovary and the oviduct. Usually, one tubule alone is affected, and the cyst is then unilocular; but exceptional cases have been met with in which several of the tubules have become dilated, and the cyst is then bilocular or even multilocular.[1] These cysts are often called cysts of the broad ligament, and this is, perhaps, the better name.

Cysts of the broad ligament must not be confounded with those ovarian cysts which, instead of growing free in the peritoneal cavity, develop between the two layers of the peritoneum—intra-ligamentous ovarian cysts, as Garrigues very aptly calls them in his paper on the "Diagnosis of Ovarian Cysts."[2]

Treatment.—Since these cysts do not ordinarily affect the general health or grow to a very large size, they should, as a rule, be let alone. Whenever grounds for interference arise the cyst should be aspirated,

[1] "Bursting Cysts of the Abdomen," by Wm. Goodell, *Trans. Am. Gyn. Soc.*, 1881, p. 231.

[2] *Am. Journ. of Obstetrics*, April, 1882, p. 394.

for sometimes after being wholly emptied it does not refill. Should, however, the fluid return, the cyst must be extirpated, and in precisely the same way as an ovarian tumor. There are dangers attending tapping which Bantock has pointed out—that of suppuration of the cavity and that of the degeneration of the cyst into malignant papilloma. When it is without a pedicle, it will have to be carefully enucleated from between the folds of the broad ligament, which then cover it. If this cannot be done, all of the cyst possible should be removed, the edges stitched to the abdominal wound, and a drainage-tube put in. This is the advice ordinarily given, but I have not yet met with a cyst of this variety which could not be removed. Were such an one to occur in my practice, I should be tempted to remove all of the cyst possible, and to close up the adherent portion in the cavity of the abdomen without resorting to a drainage-tube. The fluid secreted by a parovarian cyst is so bland that I believe no mischief would arise, always provided papillary excrescences are not present. The late Washington L. Atlee was accustomed to make merely a large circular opening in the cyst, without attempting to remove it, and Spencer Wells has recently revived the same method.[1]

Ovarian Tumors.

Life-History.—Inasmuch as the treatment of ovarian tumors depends largely upon their nature and their course, it will be well first to consider their life-history.

The natural course of an ovarian cyst is to grow rapidly, and, in about two years from the time of its discovery, to destroy life by exhaustion through the embarrassing pressure which it makes upon the organs of respiration, circulation, and nutrition. Malignant cysts grow more rapidly than the benign, while the latter will, on the other hand, occasionally remain for years in a state of quiescence. I have kept stationary cysts under observation for ten years, and others have been reported which lasted twenty years without change.

As a cyst develops it is very likely to contract adhesions to the organs with which it lies in contact. The most common adhesion is that to the omentum. Next to this is adhesion to the abdominal wall. Then will happen, more rarely, adhesions to the bowels, womb, bladder, pelvis, liver, and stomach. A loop of intestine will sometimes be found fastened to the front wall of the cyst, but usually the bowels lie packed behind the tumor. Crepitus over any portion of the cyst means that the sac-wall there is not adherent, but that it is roughened by inflam-

[1] *Handbook of Operative Gynecology*, by Hegar and Kaltenbach, 1st Amer. ed., 1887, p. 286.

matory deposits. Yet it also shows that adhesions are taking place elsewhere, and that an operation should, therefore, not long be delayed.

Rupture of the cyst sometimes takes place, either spontaneously, through over-distension, or through violence, as by a kick, from a rude fall, or from being run over by a carriage. This accident, if the fluid happens to be bland, may be followed by a cure; but more often a violent peritonitis sets in, which carries the patient off in a few hours. From a study of 257 cases, Aronson[1] rates the fatality at 41 per cent.; but, without question, the very great majority of cases of bursting cysts of the abdomen in which this accident was followed by a cure were cysts of the parovarium, which, being thin-walled, are likely to burst, and which contain a bland, unirritating fluid. Bursting of the sac can be recognized by more or by less collapse and pain, by the disappearance of the cyst, and by the lessened size of the abdomen. If the patient does not at once succumb, excessive diuresis usually occurs. The cysts most likely of all to burst are of the colloid variety, in which the walls are usually very thin. As the jelly-like contents ooze out slowly, time is given for the peritoneum to get accustomed to their presence. Acute pain or symptoms of acute peritonitis are usually absent. But the patient's health begins to fail, as if by a chronic peritonitis, and at the operation, as I have repeatedly seen, the abdominal organs will be found covered, and even infiltrated, with colloid, which infects and poisons the whole system. The term "colloid," when applied to ovarian cysts, refers more to the gluey consistency of the contained fluid than to the question of malignancy. Yet my personal experience would lead me to say that such a cyst, when it bursts, behaves as if its contents were essentially malignant. So also is the behavior of a papillary cyst, which is peculiarly liable to be perforated by some of its exuberant growths.

It happens occasionally that the inner cyst-wall inflames, either spontaneously, or in consequence of being tapped, or from other injury. Suppuration then takes place; the contained fluid becomes fetid, and offensive gases are generated which give a tympanitic sound on percussion. There will be creeping chills, a red tongue, night-sweats, a frequent pulse, and a general rise in the temperature with evening exacerbations: in one word, all the well-known symptoms of blood-poisoning will be present in a greater or less degree. Unless the cyst be at once removed the woman will speedily die.

Ulceration of the cyst, with perforation of its wall, may also occur. The decomposing contents will then be discharged, either into the peritoneal cavity or into any viscus to which the cyst may have contracted adhesions. In this way the purulent contents of an ovarian cyst have

[1] *Am. Journ. of Obstet.*, Nov., 1883, p. 1210.

been discharged through the bowels, the bladder, the vagina, and even into the womb through the oviducts.

Hemorrhage within the sac is an occasional accident. When it takes place the tumor rapidly enlarges, great abdominal pain is caused by this sudden stretching, the complexion grows pale, and the features become pinched; there will be collapse and all the symptoms of internal hemorrhage. If the bleeding does not stop, the patient will die in a few hours. On the other hand, if she survives the immediate danger, she is liable to succumb later to septicæmia, which arises from the decomposition of the now bloody fluid. The immediate removal of the cyst gives the woman, then, her sole chance of life.

Torsion, or twisting, of the stalk of an ovarian tumor by axial rotation is another serious complication, which leads to its strangulation and to gangrene, with consequent fatal peritonitis. The chief factors of this accident are, probably, the filling and emptying of the bladder and rectum, which may rotate an unadherent cyst with a long stalk. The symptoms of axial rotation, as carefully noted by Tait[1] and Aronson,[2] are sudden accession of severe abdominal pain and tenderness, a rapid increase in size, and incessant vomiting, the matter thrown up soon becoming green. The pulse rises, but the temperature is not always affected, and rigors are absent. Such a train of symptoms should lead at once to the abdominal section. Slow torsion of the stalk may result in its separation, and in the nourishment of the tumor by adhesions. The tumor, thus becoming parasitic through transplantation, is often quite a puzzle to the operator.

Tubo-ovarian Cysts.

Cases are occasionally reported in which an ovarian cyst has formed a communication with its oviduct. The fluid contents then may dribble away continuously from the womb into the vagina, and the woman is kept constantly wet. Far more frequently, however, the cyst enlarges up to a certain point, and then, bursting into the oviduct, rapidly empties itself and collapses. It then refills, to repeat the process over again. Or the cyst may lose only a small portion of its contents by sudden and unexpected gushes. These cysts are called tubo-ovarian cysts.

Surgical Treatment of Ovarian Tumors.

In the consideration of this subject it may be divided into the palliative treatment and the radical treatment. No regard will be paid to any special medical treatment, because all efforts in that direction have long since proved to be wholly unavailing.

[1] *London Obstet. Trans.*, vol. xxii. p. 97.
[2] *Am. Journ. of Obstet.*, Nov., 1883, p. 1211.

Palliative Treatment.—Tapping, either by the trocar or by the aspirator, comprises the only palliative treatment of ovarian cysts; yet, as a broad rule with but few exceptions, an ovarian cyst should not be tapped. The objections to this operation are—that, slight as it may seem, it is by no means devoid of danger. Even when the smallest hollow needle of the aspirator has been used, inflammation of the cyst may follow, which will compel the immediate resort to ovariotomy, and very greatly compromise the success of this radical operation.[1] This has repeatedly happened—once in one of my own cases, in which, however, the removal of the cyst saved my patient's life. Further, the fluid of a polycyst is acrid—so much so sometimes as to irritate the hands of the operator[2]—and the escape of a few drops into the cavity of the peritoneum may set up a violent and rapidly fatal peritonitis. Then, again, a fatal hemorrhage may take place from some wounded vessel, either in the cyst-wall, or in the adherent omentum, or in the vascular pedicle which may lie spread out in front of the cyst-wall, or indeed in the abdominal wall itself, for the vessels here are often varicose from impeded circulation. In the fourth place, adhesions are very likely to form after tapping. Fifthly, innumerable daughter-cysts, which were very small before the tapping, being now relieved from pressure are liable to take on rapid growth and to make the tumor more solid; and the more solid the sac the longer the incision needed for its removal. Sixthly, in polycysts not only are the dangers attending the operation enhanced, but the cyst rapidly refills, and the woman becomes exhausted by the drain on her system. At the very best, 2 per cent. of cases of tapping in polycysts are fatal, even when performed by the most skilled specialists. Seventhly, a cyst once tapped rapidly refills, and soon needs repetitions of the operation. This drain on the system quickly tells upon the woman, and she is sometimes left too weak to have the radical operation performed. The first tapping, indeed, greatly hastens on this crisis, and it should therefore be put off as long as possible. Eighthly, a cyst emptied by tapping tends to rotate on its axis, and torsion of the pedicle may result, ending in gangrene and peritonitis. Ninthly, repeated tappings tend to convert benign papillary ingrowths into malignant. Tenthly, there is a danger of subsequent infection of the peritoneum by a papillomatous or a colloid protrusion through the cyst-puncture or by the escape into the abdominal cavity of malignant germs.[3] Finally, Lawson Tait[4] draws attention to the fact that "repeated tappings deprive the blood of some element or elements included in the infinite

[1] *American Journ. of Obstetrics*, Nov., 1883, pp. 1169 and 1189; also *Transactions American Gynecological Society*, vol. ii., 1877, p. 270.

[2] *British Gynæcological Journ.*, May, 1887, p. 92.

[3] *Medical News*, Jan. 29, 1887.

[4] *Midland Medical Society, Lancet*, Feb. 18, 1882.

variety of albuminous substances found in ovarian cysts, the deficiency of which predisposes to coagulation of blood." Hence after the removal of the cyst deaths have been "due to the formation of a firm white clot which started from the point of ligature of the pedicle and slowly traversed the venous system until it reached the heart, death ensuing in from thirty to forty hours after the operation. The symptoms which precede death are swelling of the legs, rapid rise of the pulse, and its disappearance from the extremities some time before death, and breathlessness, ending in suffocation and slight delirium." He has met with several such cases of venous thrombosis starting from the pedicle, and they all occurred in patients who had been previously tapped.

There are, however, cases in which tapping cannot be dispensed with; for instance:

1. Many women with ovarian tumors, having heard of cases of abdominal effusion or of abdominal cyst in which tapping was followed by a cure, will not submit to the radical operation until repeated tappings have proved to them the futility of the trocar.

2. Cysts of the parovarium and of the broad ligament being sometimes cured by the use of the trocar, it may be proper to try the effect of one tapping in slow-growing, unilocular, thin-walled, and flaccid cysts, which thus exhibit the chief characteristics of these extra-ovarian cysts. On this point there is a difference of opinion among leading ovariotomists. Keith advocates this practice, but Bantock and Thornton oppose it, on the ground that papillomata often exist in these cysts, and that a tapping is liable to infect the peritoneum.

3. When an ovarian cyst develops during the later months of pregnancy, it will often be best to resort to tapping in order to relieve the woman from the pressure of two growing organs and enable her to go to full term. Sometimes labor is made impossible by the presence of a cyst, which will then have to be emptied.

4. In very large tumors which by pressure interfere with the functions of the kidneys, heart, and lungs, thereby causing albuminuria, œdema, or dyspnœa, tapping is a useful prelude to ovariotomy. By the relief from pressure afforded to these organs, not only will the liability to shock be lessened, but also to hemorrhage, for vessels previously varicose will now contract to their natural calibre.

5. Tapping may be needed to give relief in pneumonia, bronchitis, typhoid fever, or in other acute diseases.

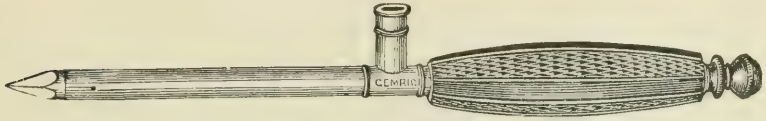
6. In cases of doubtful diagnosis, or in those in which, from malignancy, from formidable adhesions, or from other circumstances, the radical operation is deemed impracticable, tapping in the first case may clear up the diagnosis, and in the latter ones will prolong the patient's life. But it must always be borne in mind that in a few weeks the

fluid will reaccumulate and the operation will have to be repeated, rapidly exhausting the patient by the drain on her system. It is well, therefore, to put off the first tapping as long as possible.

Tapping may be performed through the abdominal wall, through the vagina, or through the rectum, but, for reasons which will presently be given, the first mode is decidedly the best.

Tapping through the Abdominal Wall.—For this operation either the aspirator may be used or else a trocar. One of the best has an elbow for a rubber-tube attachment (Fig. 283). Of the two, I should prefer the former. In aspiration, after the bladder has been emptied, the woman lies on her back, close to the side of the bedstead, with her abdomen exposed. The preferable site of puncture is in the linea alba, midway between the navel and the symphysis pubis; that is to say, at a point where the tissues, being tendinous, are most free from blood-vessels, and where the omentum is most out of the way. But if at this point the tumor feels solid, or an underlying knuckle of intestine is discovered by percussion, or the vessels look varicose, any

FIG. 283.



Trocar with Elbow Attachment.

other place in the abdominal wall may be selected where fluctuation is most manifest, provided it lies below the level of the navel. The reason for choosing a low site for the puncture is, that if the hollow needle be plunged in at any point above the navel, it may slip out of the cyst as the latter collapses even before it is wholly emptied. The skin is now thoroughly cleansed with soap and water, and washed with a 5 per cent. solution of carbolic acid. The painful part of the operation being the penetration of the skin, the selected place for puncture should either be frozen with the ether spray or be benumbed by a lump of ice dipped into table-salt or be rendered insensitive by the injection of a little cocaine solution. After the aspirator-jar has been exhausted of air, the hollow needle, or canula, armed with its stilette, is lubricated with carbolated oil or with vaseline, and rapidly plunged deeply into the cyst. Should the cyst not wholly collapse, the canula has probably become obstructed, and it should be cleared out by one of the blunt stilettes, which are made of different sizes to fit the different canulas. Sometimes the flaccid walls of the sac, as it becomes more and more empty, are sucked up into the end of the canula and the flow of fluid is suddenly arrested. This is recognized by a peculiar valve-like vibration communicated to the instrument, and is overcome by raising

up the end of the canula or by directing it to another part of the cyst. Should, on the other hand, other cysts present themselves, they can be emptied, without withdrawing the canula, by reintroducing the stilette and by directing its point to each cyst in succession.

When the fluid ceases to flow, the forefinger and thumb firmly compress the fold of the abdominal wall behind the canula, as it is withdrawn, so as to avoid the entrance of air, and the small puncture is covered with a piece of adhesive plaster. A pad of cotton wool is now laid over the scaphoid abdomen and a flannel binder applied. These afford a grateful feeling of support, and take away that sense of goneness which is likely to follow. To avoid all risks of inflammation the patient must keep her bed for three or four days and eat sparingly.

When a large trocar is used, the operation should be performed with antiseptic precautions. The skin should be previously incised with a lancet, and, lest air should be sucked up into the sac, the free end of the rubber tubing should touch the bottom of the bucket, so as to be always immersed in the escaping fluid. This rubber tubing acts as a siphon with great suction power, and the cyst is more rapidly emptied by a trocar than by the aspirator. Yet I cannot help believing that the latter, by its small size, is by far the safer instrument, and I always use it when a simple tapping is aimed at. Should any stubborn bleeding follow the removal of the canula, a hair-lip pin may be passed across the wound deep enough to get below the wounded vessel, and compression made by a turn or two of silk ligature around the pin. The same means are to be adopted to stop the oozing of fluid, which sometimes takes place when a cyst with colloid contents cannot be wholly emptied by the trocar. For it is highly prudent under such circumstances to stop the oozing, as some of the fluid is sure to get into the cavity of the peritoneum, with very generally fatal effects. In such a case the pin ought to include the lips of the wound in the cyst. To avoid as much as possible the escape of irritating ovarian fluid into the cavity of the abdomen, the cyst when tapped should always, if possible, be wholly emptied. This is a rule without an exception. It is, therefore, very bad practice to remove, even with the hypodermic syringe, a few drops of the fluid for microscopic examination. Several cases of death from this cause have been reported.[1] I lay stress on this point because in the earlier editions of my *Lessons in Gynæcology* I advocated this reprehensible practice.

Tapping through the Vagina.—This operation is sometimes a very tempting one to perform, when one of the cysts of a polycyst is pressing downward behind the bladder and causing dysuria. But it is by no means so safe as the suprapubic mode of tapping. The reasons for this are—(*a*) The vessels are larger and lie closer together in the

[1] *American Journal of Obstetrics*, April, 1876, p. 146.

lower wall of the cyst near the stalk; (*b*) in a polycyst the larger cysts, growing where they have most room, usually develop in the abdominal cavity, while the more solid portion remains below in the pelvic region; (*c*) other organs, such as the bladder, womb, and rectum, are liable to become dislocated and to lie in the track of the trocar; (*d*) the roof of the vagina responds to every respiratory movement of the diaphragm, and a cyst low down is not, from pelvic adhesions, so likely to collapse when tapped as one higher up; hence the cyst is liable to act as a pair of bellows, sucking in air and expelling it. This inevitably causes suppurative inflammation, with all its attendant evils. For these reasons this mode of tapping is never resorted to, except in cases of pelvic adhesion or in those in which the cyst starts from the lower side of the broad ligament and grows downward. Even then it is done only to relieve the distress caused by the double pressure upon bladder and rectum. In such cases the aspirator should be used, as it lessens all risks. Should suppurative inflammation set in, the sac must be removed, or, if that is not practicable, it must be again emptied, the wound kept open by a drainage-tube, and the cavity thoroughly cleansed by daily injections of antiseptic fluids.

Tapping through the rectum has long ago been abandoned by the profession, as it ought to be, except in some very rare cases of atresia vaginæ. It was at one time supposed to possess advantages over the vaginal method, because the opening was not likely to close up, and the subsequent offensive discharges could be retained at will, like the other contents of the bowel. But the cavity of the sac always became distended with fecal gas, and fatal septicæmia was pretty sure to set in.

Radical Treatment.—Tapping, followed by the injection of iodine into these cysts, has sometimes been rewarded with a cure, and at one time this mode of treatment had very warm advocates. After the cyst is wholly emptied by aspiration, the action of the instrument is reversed, and from two to ten ounces of the officinal tincture of iodine are thrown in. The tincture is used of full strength, because the residual fluid in the cyst will be enough to dilute it. The cyst-wall is next kneaded, and the patient made to turn from side to side and from back to chest, so that the tincture may come in contact with every portion of the secreting surface of the cyst. The fluid is then pumped out, but all cannot be brought away; enough usually remains behind to produce some slight constitutional disturbance. While the canula is being withdrawn, in order to prevent the escape of any of the irritating injection into the abdominal cavity, the thumb and forefinger are made to grasp the fold of abdominal wall at the puncture-site, and to press it firmly down on to the collapsed cyst-wall. Good and lasting cures have followed such a treatment; but since they can happen only in

monocysts, which are almost always parovarian, and not ovarian, it is probable that the mere emptying of the cyst would have done as much. In polycysts such a treatment is not to be thought of, for it would be attended with far more hazard than even the operation of ovariotomy. At the present day injections of iodine are practised only by physicians who do not operate; ovariotomists never resort to them.

Tapping, followed by enlarging the wound in the cyst, stitching its edges to those of the abdominal wound, and permanently keeping it open by tents or by one or two large drainage-tubes, has frequently been attended with success. But since extensive and prolonged suppuration must inevitably ensue, this operation has proved to be a far more dangerous one than that of ovariotomy. It should, therefore, not be resorted to excepting in cases of cysts which are too adherent to be removed. The after-treatment consists in treating the case precisely as if it were an abscess. The cyst is kept empty by draining, and sweet by such detergent agents as solutions of iodine, corrosive sublimate, carbolic acid, potassium permanganate, and the liquor sodæ chloratæ. I have had but one such case, a patient of Dr. C. A. Currie, in which the cyst was wholly adherent to all the pelvic organs and structures, and had besides a communication with the bladder. Not daring, under such circumstances, to remove it, I treated it successfully by incision, drainage, and disinfecting injections; but it was a long time before the drainage-tube could be removed and the woman be released from her bed. Cases, indeed, have occurred in which six months elapsed before the drainage-tube could be taken out and the woman pronounced well.

Another exception in favor of this operation may be made in the case of small cysts growing downward and bulging into the hind wall of the vagina. It may then be advisable to follow Noeggerath's plan. He snips open the vagina transversely behind the cervix to the length of one inch, and makes a corresponding incision in the cyst-wall. The edges of the two incisions are then stitched together, and a drainage-tube put in. Thus, the cyst is left with a free and permanent opening into the vagina, through which such antiseptic solutions as have been noted above are thrown up. In time the collapsed cyst-walls adhere to one another and cease to secrete.

Electrolysis has of late also been lauded as a sure and harmless remedy for these cysts. But a careful examination of the subject made by Mundé shows that this agent has been greatly overrated as a specific, and that it "can in no wise supplant ovariotomy."[1]

Rupture of ovarian cysts has occasionally taken place, either through over-distension or through such violence as a rude fall or an upset from a carriage. This accident, if the tumor were a monocyst or if the fluid

[1] *Transactions American Gynecological Society*, vol. ii. p. 435.

happened to be bland, sometimes ended in a lasting cure. The hint was not thrown away, and several surgeons cut circular openings into the cyst, in order to establish a permanent communication with it and the abdominal cavity. But this practice was soon given up, because it was found that the intrusion of ovarian fluid into the serous cavity usually set up a violent and rapidly fatal peritonitis. For such an accident, when followed by inflammation, there is but one remedy—the immediate removal of the cyst by ovariotomy. Desperate as this remedy seems, it has repeatedly been followed by success. The only cyst in which it might be held warrantable to establish a communication with the abdominal cavity is that of the parovarium recurring after repeated tappings, and so bound down by adhesions or so covered by the broad ligament as to be irremovable. The fluid it contains is so limpid and bland as not ordinarily to inflame the peritoneum.

Ovariotomy.

The term "ovariotomy" comes from *ὠάριον*, ovary, and *τομή*, an incision. It is a barbarous compound, which is forced into meaning the operation for the extirpation of an ovary on account of some disease of its own structures that causes it to increase in bulk. A fibroid or a sarcomatous degeneration of this organ will sometimes happen, but cystic degeneration is by far the most common form of disease to which the ovary is liable. When both ovaries are enlarged and removed the operation is called double ovariotomy. The terms ovariotomy and oöphorectomy (*ὠόφορον* and *ἐκτέμνο*, to cut out the ovary) really mean the same thing, the latter word, indeed, being the more appropriate. But by modern usage the former is limited to the operation for the removal of an ovary greatly enlarged by some intrinsic disorder. By oöphorectomy is now meant the operation for the removal of diseased ovaries which are not larger than an orange, or of diseased ovaries and tubes, or of both ovaries for the purpose of bringing on the menopause, and thus curing diseases kept up or caused by the functional existence of those organs, while the ovaries themselves may or may not be diseased.

Before the eighteenth century the operation of ovariotomy as a radical cure had been suggested by a number of physicians, but it had never been put into practice. Later, John Hunter and John Bell both advocated the operation, but neither ventured to perform it. This honor was reserved for Ephraim McDowell, a Virginian practising in Kentucky, who had attended Bell's course of lectures delivered in Edinburgh in 1794, and had imbibed the opinions of his teacher. He returned to Kentucky in 1795, and began at once to practise his profession, but it was not until 1809 that he first met with the opportunity

for performing ovariotomy. The operation was successful, his patient having lived thirty-two years longer, and having died at the end of her seventy-eighth year. Before his own death, which occurred June 25, 1830, in the fifty-ninth year of his age, McDowell had performed 13 ovariotomies, with 8 recoveries.

In spite of McDowell's success, and in spite of a large and growing percentage of recoveries reported by Atlee, Clay, and Spencer Wells, this operation was condemned so violently by the profession that its advocates were fairly ostracised, and twenty years have hardly elapsed since it has been put upon as firm a basis as any other capital operation in surgery. "In 1843, Diffenbach, the boldest of all surgeons then living, wrote that ovariotomy was murder, and that every one who performed it should be put into the dock. Now," writes Nussbaum, "we save lives with it by the hundred, and the omission of its performance in a proper case would in these days be looked upon as culpable negligence."

The most common causes of death after ovariotomy are septicæmia or septic peritonitis, traumatic or frank peritonitis, shock, exhaustion, and hemorrhage; and it is against these foes that the operator must from the first aim all his efforts. This brings us to the consideration of the statistics of ovariotomy; but all statistics depend so much upon accidents and contingencies, as well as upon personal equations, that they are always untrustworthy. Further, some statistics do not note or detail the cases which have been declined, or the cases of exploratory incisions, or those of incomplete operations. Yet the life of a woman with an ovarian tumor is doomed if the chances of an operation are denied to her, or if the incision is limited to an exploratory one, or if the operation is an incomplete one. Her death from the tumor is virtually as assured as if she had had a fatal but complete operation performed on her. Hence, an operator with a record better than another's may not actually have saved as many lives in the hundred as the latter. "Brilliant statistics," says Hegar, "sometimes depend chiefly on the exclusion of cases which are anatomically and technically complicated, and in which the indications for operative interference are often the most imperative."[1] Another flaw in ovarian statistics is the tacit understanding among operators to consider a case as recovered if death takes place after the end of the fourth week.

Yet in no other operation does the issue depend so largely on the experience of the surgeon. Every ovariotomist finds that his success grows with the number of his cases. Of 1000 successive ovariotomies, Wells lost 34 out of the first group of 100 cases, and but 10.9 per cent. out of the last group of 100.[2] Out of his first 50 ovariotomies, Lawson

[1] *Op. cit.*, p. 268

[2] Wells' *Abdominal Tumors*, ed. 1885, p. 64.

Tait had 19 deaths;[1] but he has since had a run of 139 cases without Listerism and without a death.[2] Keith, who began with a mortality of about 20 per cent., had a series of 100 cases with 97 recoveries. 80 of these were successive.[3] Schroeder had 17 deaths in his first 100, 18 deaths in his second 100, and 7 deaths in his fifth 100.[4] Winckel lost 65 per cent. out of his first cases, and only 12 per cent. out of his last 100 cases.[5] Martin lost 15 out of his first 52 cases, and but 3 out of his last 100.[6] Knowsley Thornton, out of his first 328 cases, lost 10.67 per cent.[7] In his last 300 cases the mortality was only 7 per cent:[8] 48 of these cases were without a death. Bantock, Skene Keith,[9] and Homans[10] had respectively 50, 49, and 38 successive cases without a death. Of my own first cases I lost about 1 in every 3. Lately I had 31 cases with but 1 death. In the last two years I have had 57 cases with 5 deaths, or a percentage of 8.7 per cent.[11] The great majority of these cases were operated on in my private hospital, where every detail of antiseptic surgery can be accurately carried out and where the patients are directly under my care.

The statistics of general hospitals are by no means so good, private or special hospitals showing to much greater advantage, even when compared with the patients' own homes. In the Vienna General Hospital during the year 1881 "ovariotomy was performed 64 times, with 38 complete recoveries, 25 deaths, and 1 woman was discharged with marasmus."[12] The statistics of two hospitals—viz. Birmingham General Hospital and Birmingham Hospital for Women—show as follows during a period from January, 1878, to September, 1885: Birmingham General Hospital—Ovariotomy, 35 cases, 11 deaths; mortality, 31.4 per cent. Birmingham Hospital for Women—Ovariotomy, 268 cases, 19 deaths; mortality, 7.1 per cent. Of total laparotomies, the former had 85 cases, with 21 deaths, or a mortality of 24.7 per cent.; the latter had 632 cases, with 49 deaths, or a mortality of 7.7 per cent.[13]

Nor are the statistics of the general practitioner much better. Taking the profession at large, out of 5153 cases of ovariotomy collected by Baum, there was a mortality of 29.13 per cent.[14] Out of 2023 cases collected by Younkin, the mortality was 27 per cent.[15] Out of 696 cases of ovariotomy performed by 96 Russian surgeons, 213 died. By opera-

[1] *Medical Record*, Jan. 3, 1885, p. 2, and *Brit. Med. Journ.*, April 15, 1882, p. 544.
[2] *Brit. Med. Journ.*, May 15, 1886, p. 921.
[3] *Brit. Gyn. Journ.*, May, 1887, p. 24.
[4] Wells' *Abdominal Tumors*, p. 65.
[5] Winckel's *Diseases of Women*, p. 571.
[6] *Frauenkrankheiten*, 1885, p. 483.
[7] *Medical News*, Jan. 27, 1883, p. 117.
[8] Personal communication.
[9] *Trans. Brit. Gyn. Soc.*, 1887, p. 24.
[10] *Laparotomies*, p. 7.
[11] *Medical News*, Jan. 30, 1886, and Jan. 29, 1887.
[12] *Ibid.*, Dec. 30, 1882, p. 745.
[13] Price: *Journ. of Am. Med. Assoc.*, Feb. 5, 1887, p. 158.
[14] Agnew's *Surgery*, vol. ii. p. 811.
[15] *New York Medical Record*, Nov. 11, 1882, p. 560.

tive skill, by cleanliness, by wise hygienic measures, and probably by the use of antiseptic precautions, the fatality has been reduced by skilled specialists to an average lower than that of any other equally severe surgical operation; which, considering the size of the wound, the importance of the parts involved, and the delicacy of the exposed structures, is very remarkable. Yet the statistics of the best operators in the United States, while very excellent, are not quite so good as those of a few of the leading operators in Europe. This is probably due, not to less judgment or to inferior manipulative dexterity, but to two causes: 1st. Our country is a very large one, and patients at a distance from specialists delay in consulting them. 2d. Our physicians have not yet been educated up to sending their patients early, and not to tapping them. The result is that most of the cases operated on in this country have large tumors and many adhesions, while the patients themselves will usually put off the operation until reduced to the last extremity. On the other hand, patients in Europe are operated on early, while the tumor is small and the health good. For instance, Skene Keith refers to his better success as a beginner than his predecessors' in the following language: "What is the reason of the greatly-diminished number of deaths? One of the most important, and one of which little notice has been taken, is that the operations are less severe than they used to be," because they are not now postponed until they have to be done.[1] Again, Tait writes: "In cases of ovarian tumor it is very seldom necessary to use a drainage-tube, because now-a-days, that we get patients at an earlier stage, before adhesions have been secured by repeated tappings, there seldom occurs the need of drainage."[2]

This brings up the question of simple or of aseptic ovariotomy—a very important question and one not yet fully settled. The objections to Listerism are—that it is very troublesome; that it is liable to poison the patient fatally, as well as to injure the health of the operator; that it is useless, indeed merely a surgical craze; and that it is not the carbolic acid which does good, but the cleanliness enforced by this system. But there is no doubt that since the introduction of antiseptic surgery the mortality has been much lessened in every land. For instance: "In Germany, where the success of ovariotomy had not been so good as in other countries, the mortality by means of the antiseptic treatment has been reduced from 90 to 20 per cent."[3] From an analysis of all the cases of ovariotomies performed by American surgeons, "the percentage of recoveries is overwhelmingly in favor of Listerism."[4] On the other hand, Thomas Keith of Edinburgh and Tait of Birmingham, thus far the most successful of ovariotomists, have wholly abandoned

[1] *Brit. Med. Journ.*, Feb. 5, 1887, p. 271. [2] *Brit. Gyn. Journ.*, Aug., 1887, p. 191.
[3] Agnew's *Surgery*, vol. ii. p. 800.
[4] H. C. Bigelow: *Am. Journ. of Obstet.*, July, 1882, p. 651.

Listerism. The former gentleman, indeed, claims now "to get as good results without it, and better results than any one has yet got with it."[1]

But statistics are very ticklish and untrustworthy things. For instance: During the year 1881, in the Samaritan Hospital of London, Thornton and Meredith used the carbolated spray of 1 in 40 and followed out every detail of antiseptic surgery. They had a mortality of 7 per cent. Bantock in the same institution, after gradually lessening the strength of the spray until water was alone used, finally gave even it up altogether. He, however, for purposes of cleanliness, always covered the instruments in the tray with water. The mortality of his operations showed the high rate of 20 per cent. The house committee, a body of laymen, thereupon "expressed a strong opinion against the performance of ovariotomy for the future without full antiseptic precautions."[2] In 1885 the two former gentlemen had 67 abdominal sections of all sorts, with 4 deaths—a mortality of 6 per cent., while Bantock had 43 abdominal sections, with 4 deaths—a mortality of 9 per cent.[3] In 1886, however, the tables were wholly turned, for Bantock had 25 cases of ovariotomy without a death, while Thornton had 32 cases, with 6 deaths—a mortality of 18.7 per cent.[4] For the past three years the mortality in this hospital has been 10.6 per cent. with antiseptics, and 4.2 per cent. without their use.[5]

My own practice is to adhere to every detail of antiseptic surgery but the spray, which I have abandoned in my private hospital and use only in the wards of the general hospital—that of the University—to which I am attached; and I fully agree with Bigelow that "it would be a grave error to abandon a practice which has achieved brilliant results until something shall be brought forth which shall be as thoroughly protective, and in the use of which there may be no possible dangers. Time alone can demonstrate satisfactorily the relative values of Listerism and of perfect cleanliness without Listerism. The results of a large number of cases in which cleanliness and attention to detail have alone been used are the only criteria upon which we can strike a judicial balance."[6]

Contraindications for Ovariotomy.—An operation should be declined in far-advanced tuberculosis, in cancer of the ovary or of any other part of the body, in grave structural lesions of any of the vital organs, in ascites if caused by disease of the heart, of the liver, or of the kidney, in gastric ulcer, or in any serious disease of the alimentary canal. Extensive adhesions should not count as contraindications, nor should

[1] *Brit. Med. Journ.*, May 27, p. 796. [2] *Ibid.*, May 20, 1882, p. 747.
[3] W. P. Manton: *Transactions Michigan State Medical Society*, for 1886.
[4] *British Medical Journal*, February 12, 1887, p. 334.
[5] *Trans. Brit. Gyn. Soc.*, May, 1887, p. 19.
[6] *American Journal of Obstetrics*, July, 1882, p. 651.

age, since young children and very old women have been successfully operated on. Albuminuria is often due to the pressure of the tumor on the kidneys, and, unless it existed before the appearance of the tumor, or it is positively known to be caused by Bright's disease, it should not preclude the operation; but chloroform should then be used as the anæsthetic. Extreme debility dependent upon the ovarian disease makes the prognosis grave, but it should not prevent a resort to ovariotomy. I have indeed had several recoveries when the patient was so reduced in strength as to make it a very anxious and difficult task to keep her from dying on the table.

Indications for Ovariotomy.—This operation should not, as a rule, be performed, especially by inexperienced surgeons, when the cyst has first been discovered, but when it is found to be steadily increasing in size. My reason for this conservative advice is that a certain number of abdominal cysts—especially when of parovarian origin—stop growing after reaching a moderate size, and give no further trouble. I have had patients under observation for years who during that time have carried such quiescent cysts, and were not conscious of their existence. When, however, a woman broods over her condition and is anxious to have the tumor removed, the operation should be performed as soon as possible. As a rule, the earlier a growing cyst is removed the better, because, being smaller and usually without adhesions, it is then more safely removed, and because, although benign in the outset, it tends in time to take on malignant degeneration. But the technical difficulties in the removal of small tumors are greater. The pedicle is often not well developed, and if the tumor be adherent the tense abdominal walls prevent easy manipulation or inspection.

Again, when an ovarian cyst is complicated with pregnancy, it is better to perform the operation in the first half of the period of gestation; for in the last half the broad ligaments receive a large supply of blood, all the pelvic vessels become varicose, and the structures forming the pedicle are turgid and vascular. Pregnancy is indeed no bar to the operation, the prognosis being favorable both to the mother and to the child. Schroeder and Olshausen performed 21 ovariotomies in pregnant women, with only 2 deaths.[1]

When septic peritonitis sets in; when the contents of the sac become purulent, as they sometimes do, either spontaneously or after an unprotected tapping; when the cyst bursts and serious symptoms arise; when torsion of the pedicle occurs; or when a free hemorrhage into the sac takes place,—the radical operation should unhesitatingly be performed, and that without any delay.

Preparation of the Patient for the Operation.—The operation having been decided upon, every precaution must be taken to ensure a favor-

[1] *British Medical Journal*, Dec., 1880, p. 1027.

able result. The patient should avoid all exposure to contagious or to zymotic diseases, and she should be put in the very best condition of health possible under the circumstances. If the kidneys be inactive and the urine highly concentrated, depositing mixed urates in abundance, it will be well for the patient to make use of warm baths and to take saline cathartics in quantities sufficient to secure a daily action of the bowels. The alkaline carbonates, largely diluted, will also prove beneficial, and so will also the effervescent citrate of lithia. Sometimes, and especially when anasarca and œdema of the legs occur, it may be advisable to relieve the pressure-congestion of the kidneys by a preliminary tapping. Other organs will also be relieved, and valuable time for the action of medicines is often gained by emptying the cyst. Tonics, iron in the form of Basham's mixture, a generous diet, and fresh air may be needed. A trip to the seashore or to the country will often do much good in preparing a broken-down patient for the operation. If the patient comes from a malarial district, from twenty to thirty grains of quinia should be given during the twenty-four hours for two or three days before the operation, and ten grains a few hours before the time of the operation. If this be not done, a severe explosion of malarial fever after the operation may put the patient's life in jeopardy.

An operation of election should not be undertaken during a monthly period. It should be performed either about ten days before one or about a week after one. The very best time is midway between two fluxes. When, however, through some lesion or some accident, immediate relief is demanded, no regard whatever should be paid to the factor of menstruation. Some surgeons operate, indeed, in any case whether the woman is menstruating or not, and profess to find no difference in the result.[1] I have done so repeatedly, and with no bad results.[2]

For several days before the operation the bowels should be kept open, and the diet should consist largely of bread and soup, or of milk, eggs, and rice, or of wholesome and easily-digested food. It is well also for the patient to keep in bed or in the recumbent posture for two or three days before the operation. It will accustom her to confinement, and will teach her how to pass her water while lying on her back; which many women cannot do without a preliminary education. On the day preceding that of the operation the upper portion of the pubic hair should be cut off and the abdomen, if hairy, shaved. In the evening the patient takes a warm soap-bath, and is washed perfectly clean by her nurse, who must be an experienced woman, able to pass the

[1] T. Savage: *Brit. Med. Journ.*, April 14, 1883, p. 712; also, H. P. C. Wilson: *Maryland Med. Journ.*, Dec. 17, 1887.

[2] *Medical News*, January 29, 1887.

catheter and to take the temperature. She then puts on clean clothing and goes to bed, where she stays until the hour fixed upon for the operation. To ensure sleep in nervous women, I am in the habit of giving at bedtime thirty grains of potassium bromide. Early in the morning of the day preceding that of the operation a dose of castor oil is administered, and it is much more easily swallowed if disguised in some vehicle and brought to the patient without any previous warning. When oil cannot be taken, I give, at bedtime of the previous evening, and in one dose, two compound cathartic and two Lady Webster pills. On the morning of the day of the operation, to avoid ether-vomiting, the breakfast should consist merely of one piece of dry toast and a cup of tea, or of a cup of beef-tea, or of a goblet of milk, and afterward she must eat nothing more. To calm the nerves another thirty-grain dose of potassium bromide may be given, especially if the woman be at all agitated. It is well also now to open the lower bowel by an enema, and to wash out and disinfect the vagina by a douche of a solution of 1 : 2000 of corrosive sublimate.

My favorite hour for operating is nine o'clock in the morning, when no food whatever will be needed beforehand, and when the physician and his assistants will not have made any professional visits beforehand. Another very good time for operating is from noon to two o'clock in the afternoon, for by that time the light breakfast will have been digested. At the hour fixed upon for the operation the woman puts on a flannel sacque, warm stockings and drawers, and empties her bladder.

The bedstead on which the woman is to lie after the operation should have a horse-hair mattress, and should be wide enough to permit her attendants to move her on a draw-sheet from one side of it to the other. I formerly placed my patients on narrow single bedsteads, so that they could be reached and be waited upon equally well from either side; but I found that an unchangeable position on the back soon became intolerably irksome. Next, indeed, to the thirst following the operation, my patients complain mostly of the supine posture which they are compelled to assume.

The room in which the operation is to take place ought to be a separate one, so that the lady can be etherized in her sleeping-room, and may not be unnerved by witnessing the needful preparations. Several days beforehand the carpet of the operating-room should be taken up and the curtains taken down. Every useless piece of furniture should be removed, the closets and bureau-drawers emptied, and the whole room thoroughly cleansed and ventilated. Several hours before the time of the operation this room ought to be heated to a temperature of 75°, and the air disinfected and made moist by a solution of carbolic acid kept boiling in a dish on the stove or over an alcohol lamp.

Let me here say that, if possible, this operation should not be performed within the walls of a crowded general hospital nor in unhealthy localities, but, as statistics well show, in private houses, or, far preferably, in small special hospitals.

Articles Needed for the Operation.—The following articles should be provided by some member of the patient's family. Following the example of the late Washington L. Atlee, I have a printed list of them, which is sent to the family physician some days before the operation:

One yard of rubber plaster;
Two rolls of raw cotton, made aseptic by being baked in the range-oven just before the operation;
Two yards and a half of fine white flannel, for two binders;
Two pounds of the best ether;
Two gallons of a 5 per cent. solution of the best carbolic acid, made at least two days beforehand;
Four ounces of Monsel's solution of iron;
An ounce of iodoform;
Twelve ounces of undiluted alcohol for the spray-producer;
Some old whiskey, with cup, spoon, and sugar;
A nail-brush, basin, and soap;
A pin-cushion, with large pins and safety-pins;
Two kitchen tables or two dressing-tables on which to operate;[1]
One small stand for the spray-producer;
One small table for the basins and sponges;
One chair without a back for a bucket of hot water;
Two new tin basins and one tin cup;
A new bucket and a jug of hot water;
Two kettles of boiling water, ready on the range;
Pure cold water in abundance, that has been previously boiled;
A small tub and an empty bucket;
Six bottles filled with hot water and tightly corked;
An empty wine-bottle for the aspirator;
A rubber ice-cap, or two pig's bladders, for holding ice;
A rubber cloth one yard and a quarter square, with an oval hole in the centre six inches wide and eight long;
Two kitchen aprons for the operator and his assistant;
One clean blanket for the patient's lower extremities;
Two large platters or two meat-dishes, to be used as trays for the instruments;[2]
Clean towels, clean sheets, clean blankets, clean comfortables, and clean pillows.

Instruments.—In simple cases very few instruments are needed, but, as one never knows beforehand what complications may be met with, it is best always to be prepared for every emergency. One must there-

[1] Or an operating-table can be made expressly for the occasion. It should be 22 inches wide, 31 inches high, and 6 feet long.

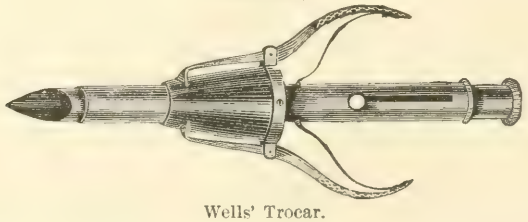
[2] These platters are usually too shallow to hold a solution of carbolic acid deep enough to cover the bulkier instruments. It would, therefore, be well to have a tin tray made especially for the purpose, measuring 19 inches long, 12 wide, and 3 deep; or a nest of smaller trays can be carried in the operator's bag.

fore have on hand every instrument likely to be wanted in the most formidable operation. The following list comprises all the instruments and other articles that I carry with me in my operating bag; but it will not suit every surgeon, who will, after a few operations, choose his own favorite instruments:

One steam spray-producer, which will work two hours;
Assorted silk ligatures on glass spools;
Lister's antiseptic gauze or salicylated cotton;
Two dozen straight surgeon's needles;
Assorted needles with varying curves;
Two aneurismal needles for transfixing pedicles;
One needle-holder;
One hypodermic syringe;
Two dozen assorted pressure-forceps;
One uterine tenaculum;
Assorted hare-lip pins and acupressure needles;
One grooved director;
Two scalpels;
Baker-Brown's cautery clamp;
Ten fine surgeon's sponges of different sizes;
Two long and flat sponges;
One wire écraseur;
One wire clamp or Koeberlé's serre-nœud;
Paquelin's cautery or three cautery-irons;
One Wells' (Fig. 102) or Hodge's (Fig. 103) trocar with rubber tubing;
One aspirator;
Two Nélaton's cyst-forceps;
One straight pair of scissors;
One pair of scissors curved on the flat;
One right-angled pair of scissors;
Allis's improved ether-inhaler;
One flexible male catheter;
Three glass drainage-tubes (Keith's) of different sizes and lengths, together with the rubber sheeting and the sponge used with them.

The twenty-four needles should be threaded, two on one thread of fine silk eighteen inches long—viz. No. 1 or 2, of an excellent quality furnished by Messrs. J. H. Gemrig & Son of Philadelphia. To keep

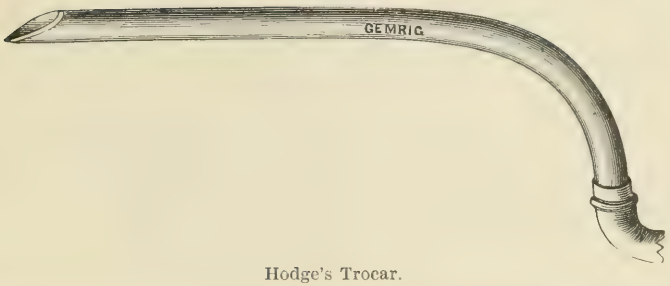
FIG. 284.



Wells' Trocar.

these threads from becoming tangled, they are rolled up in a strip of muslin gauze, each pair of two needles with their thread being covered up by one fold of the gauze. The two aneurismal needles should also

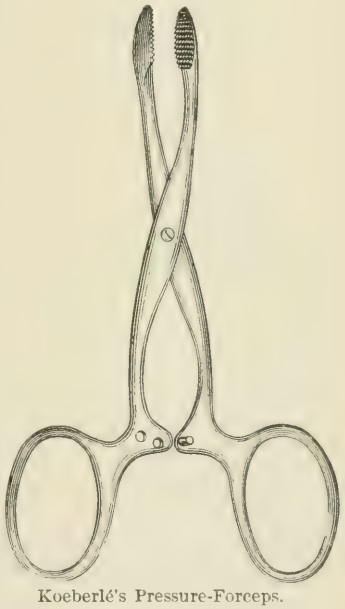
Fig. 285.



Hodge's Trocar.

be threaded, but with stouter thread (No. 3), fully two feet long. All these armed needles should be put into a 5 per cent. solution of carbolic acid for several hours before the operation. Assorted needles of varying curves come occasionally into use, and it is always well to have several very fine needles on hand, together with the finest Chinese silk, in order to close a wounded viscus, such as the bladder or the bowels.

Fig 286.

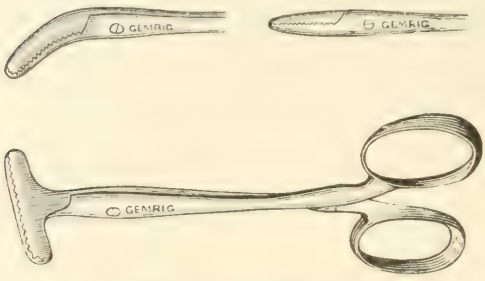


Koeberlé's Pressure-Forceps.

As an aid to the memory it is well to have, invariably at every operation, the same number of sponges and the same number of pressure-forceps, for these are the only articles likely to be left behind and closed up in the abdominal cavity. The cautery-irons should be wedge-shaped; the iron spreader used by apothecaries in making plasters forms an excellent substitute. In my hands the best pressure-forceps, or catch-forceps, is Koeberlé's (Fig. 286). Its pointed beak catches the tissues far better than that of Wells' forceps, which looks like a crocodile's muzzle. The ordinary hæmostatic bulldog clips, or the serres-fines, must on no account be used, because, if they should lose their hold and drop into the abdominal cavity, they would be too small to be readily discovered, and might indeed be hopelessly lost in the coils of the bowels. Long strings attached to each one would, however, overcome this objection. Péan's pressure-forceps with broad surfaces are often of great use, and a few should be on hand (Fig. 287).

The ten sponges must be of the best quality and about the size of one's fist. Two of them should be flat, long, and thin, such as are called by the trade "potter's sponges." They are also termed Zymoca

Fig. 287.



Péan's Pressure-Forceps.

flat sponges or "elephant's ears." When first bought sponges almost always contain sand. To rid them of this, they are beaten, then soaked for twenty-four hours in a 3 per cent. solution of muriatic acid, and afterward washed out in clear running water. Sponges should never be put into boiling water, which destroys their elasticity, shrivels them up, and spoils them. After every operation the sponges should be thoroughly cleansed in cold water, and immersed for forty-eight hours in a solution of washing soda (sodii carbonas) containing four ounces to the gallon of water. They are then rinsed out in running water, and placed in a 5 per cent. solution of carbolic acid. At the end of a week they are to be taken out and hung up in a bag. Instead of a solution of soda, some prefer an 8 per cent. solution of sulphurous acid, in which the sponges are soaked for from two to four hours. This bleaches the sponges, but it does not cleanse them so well as the alkaline solution.

Only two assistants are needed, and they and the surgeon should take a soap-bath, and not see, on that morning, any patient ill from a zymotic or a contagious disease. Their clothes should also be scrupulously clean. To ensure still further protection, each one takes off his coat, waistcoat, and neck-tie, if they are of a material that cannot be washed. The nurse must also wear clean clothing that can be washed. A few bystanders may be permitted, but they should wear clean clothing, and should also take off their coats and waistcoats. They should also be cautioned not to visit before the operation any case of contagious disease.

Preliminary Preparations.—Upon arriving at the patient's house the surgeon, together with his assistants and the nurse, proceeds at once to get everything in readiness. The two tables may be arranged in the form of a T, covered with several thicknesses of quilts, and with a pillow on the cross-table. When the tables are thus arranged, a third one will be needed for the instruments and the spray-producer. In order to economize room and furniture, I am in the habit of putting one table at right angles to the other, like the letter L reversed—viz. with its short arm to the left instead of to the right, thus: ⅃. The woman lies on the long arm

of the ⅃, with her feet directed to the short arm, and on the projecting and free portion of the table forming the short arm are placed the tray of instruments and the spray-producer. As it takes time to get up steam in the necessarily large spray-producer, hot water should be poured into the boiler, and it should be one of the first things attended to. In order not to chill the patient, the spray solution of carbolic acid should also be heated before it is used. At present, however, when using the spray —which I do only in the hospital of the University, and not in my private hospital—I do not turn it on to the wound, but I start it in the operating-room two hours beforehand, and during the operation direct it away from the patient. The edges of the oval hole in the rubber sheet are next smeared with collodion, or with some adhesive preparation; but a plaster suitable, in our climate, for all seasons of the year is not easy to devise. Keith's formula is the following, but it will not always stick:

℞. Emplastri saponis,	℥iv;
Emplastri resinæ,	℥iij;
Olei olivæ opt.,	℥j. M.

The formula used at the Samaritan Hospital of London is that of the emplastrum resinæ B. P.—viz. sixteen parts of lead plaster, *melted at a low temperature*, and then mixed with two parts of resin and one part of curd soap. The mass is stirred until the ingredients are thoroughly mixed, and 2 per cent. of melted carbolic-acid crystals is added as this is being done. If the lead plaster is melted at too great a heat, the compound will not be of sufficient consistence.[1] After many trials, Dr. W. D. Robinson of Philadelphia has succeeded in making for me a very good plaster according to the following formula:

℞. Emplastri saponis,	℥ij;
Resinæ,	℥vj;
Terebinthinæ albæ,	℥ij. M.

I must, however, add that I now very rarely use this rubber cloth, because it is not essential and it is troublesome to manage.

Not all the instruments in one's bag, but only those likely to be needed, are now counted and placed in the tray or in the platters, and covered over with boiling water, to which in a few minutes is added the same quantity of a 5 per cent. solution of carbolic acid. The best plan would perhaps be to pour into the tray a boiling 2.5 per cent. solution of carbolic acid. In the same tray is also laid the roll of gauze containing the threaded needles. By its side on the table, and within easy reach, is placed a small bottle filled with

[1] Doran's *Gynecological Operations*, 1st Amer. ed., p. 87.

a 5 per cent. carbolated solution in which are kept four small glass spools of Nos. 1, 2, 3, and 4 silk, the last being used for the pedicle. The adhesive or rubber plaster is cut into strips that will go around three-quarters of the body, to allow for tympanites, and the antiseptic dressing put in readiness. The trocar, with tubing attached, is hung on a nail near by. The sponges are carefully counted and placed in one of two basins arranged side by side on a table to the left of the patient. The other basin is one-third filled with a 5 per cent. solution of carbolic acid, which later on is reduced by the addition of pure hot water to a strength of 2.5 per cent. On a chair is placed a bucket of clean warm water.

Let me here say, once for all, that throughout the operation the assistant who looks after the sponges attends to them in the following way: Every soiled sponge returned to him is first cleansed in the bucket of warm water, next rinsed in the carbolated solution, then squeezed out and placed in the empty basin. This sequence must be rigidly observed, because, if the soiled sponge be plunged first in the carbolated water, the blood and serum which it contains will at once coagulate in its meshes, and become liable to be dislodged in the abdominal cavity as foreign bodies. Some surgeons use the carbolated solution for their instruments, and a 1 : 10,000 solution of corrosive sublimate for their sponges. A. Martin uses the latter for both sponges and instruments.

Meanwhile, the woman, in another room, has been inhaling the anæsthetic—the best being, in my opinion, the æther fortior of our leading manufacturing druggists. It should be administered by Allis' inhaler, which largely dilutes it with air. Chloroform is the better anæsthetic whenever the woman has a renal or a bronchial affection, or perhaps whenever she is old. In the aged ether tends to produce œdema of the lungs or bronchial irritation. Wells and Thornton employ the bichloride of methylene; Keith uses pure ether; Bantock resorts to chloroform; and Tait to a mixture of two parts of ether and one of chloroform, given by means of Clover's apparatus.[1] When the patient is wholly unconscious, she is carried into the operating-room and laid on the table. To this table she is strapped down by a belt over her thighs, and her hands are also secured to the same belt. Her legs are wrapped in warm blankets, and her clothes are drawn up out of the way. Her chest and body are then covered by the rubber sheet, but the edges of its oval opening are made to adhere to the skin, from just above the navel to the pubic hair, thus exposing only a limited portion of the abdomen. After this, the spray is turned on and directed toward the abdomen, unless the operator has already used it for disinfecting the room, when it may be directed away from the patient. The 5 per cent. solution of carbolic acid in the tray and in the basins is diluted with

[1] *The Medical Record*, Jan. 3, 1885, p. 2.

hot water down to 2.5 per cent. The operator and his assistants now take off their rings, and cleanse their hands very carefully with carbolated soap and a nail-brush. They may clean and pare their nails with a penknife before the use of the nail-brush, but not after, because the knife not only does not remove all the dirt, but it loosens up that which remains. Arranging themselves in their places, the operator stands to the right of the woman, the assistant who gives the ether is at her head, while the other, who attends to the sponges, takes his place near the basins on the left side of the patient. The nurse holds herself in readiness to hand towels when called for, and especially to see that a third basin always contains warm water, so that at any stage of the operation the surgeon can wash his hands without delay.

The Abdominal Incision.—When everything is ready, the door is locked, and the exposed portion of the abdomen washed, first with ether, then with a 1 : 1000 solution of corrosive sublimate. An incision, about three inches in length, is made with a free hand, and not by nicks, in the median line below the navel, where the blood-vessels are few in number. It should end about one inch and a half above the pubes; that is to say, low enough for the pedicle to be easily reached, but high enough to avoid cutting the fold of peritoneum reflected from the bladder to the abdominal wall. The brown line running below the navel is the surface guide, but in small tumors, after cutting through the skin and fat, one cannot always hit the linea alba beneath. Below the umbilicus the recti muscles lie close together, and there is virtually no linea alba. Above the navel the muscles diverge, and a true linea alba exists there. When the cyst is large, the recti muscles have become separated from one another, and there is no difficulty in keeping within the wide tendinous interspace. But when the cyst is small, the linea alba is, as its name indicates, a mere line, and the knife will often go astray into the anterior sheath of one of the recti muscles. The red muscular fibres pouting out of the opening will be the danger-signal of one's having got off the track into more vascular regions. To recover it, a probe is passed in across the muscle to the right and to the left, and the nearest point of arrest will note the linea alba. The disadvantages arising from a wandering from the linea alba are—that the sheath of the rectus muscle being cut open, or the muscle itself being wounded, there results hemorrhage; that the wound is more jagged, and therefore less easily coaptated; that suppuration in the suture-tracts is more liable to take place; and, finally, that in cases of small cysts with but little abdominal enlargement a spasmodic contraction of the wounded muscle is very likely to embarrass the operator both in removing the cyst and in introducing the sutures. Yet I am by no means sure that the subsequent cicatrix would not be firmer, and less liable to thin out into a ventral hernia, were the recti muscles incised instead of being avoided.

Again, one cannot on a grooved director cut canonically through the different layers of tissue described with so much precision in the text-books. On the contrary, a director is not needed, for all that one needs to know, is when the knife is approaching the peritoneum. An excellent landmark is the thin layer of fat overlying the peritoneum. So, after pinching up the abdominal wall to estimate its thickness, the surgeon can boldly cut down through the skin and its underlying fat, but somewhat cautiously through the aponeurotic structures, until the second layer of fat is reached. Practically, therefore, he need regard but the following layers: skin with its underlying fat, the intermediate tendinous or muscular structures, the præperitoneal fat, and the peritoneum.

Before the abdominal cavity is opened all bleeding is stopped by the use of pressure-forceps, of which one dozen will sometimes dangle from the wound. Should the tumor be malignant or adherent to the abdominal wall, the bleeding will be more free, and the præperitoneal fat will be pink instead of yellow. This fat is teased apart, or, if redundant, it is caught up by a forceps and snipped off. When the hemorrhage has been wholly stayed, and not until then, the peritoneum is hooked up by a delicate uterine tenaculum and nicked open, or else it is caught by two pressure-forceps at opposite points in the centre of the wound, raised up, and nicked open between them. On a broad grooved director or on the finger this opening is slit up for a distance of about two inches, either by a right-angled pair of scissors or by a probe-pointed bistoury. A little serum usually escapes, and the nacreous wall of the cyst comes into view. This is called an exploratory incision, for by it the diagnosis is confirmed, the presence of adhesions ascertained, and the possibility of completing the operation determined. When it has been decided to go on with the operation, more working room will be needed, and the wound is therefore enlarged by the scissors, two fingers being used as a guide to prevent injury to the omentum or to any chance knuckle of bowel that may lie in the way. The size of the incision will depend upon the character of the cyst and on the number of its adhesions. Hence it may range from a length of three inches to the distance from ensiform cartilage to symphysis pubis. An incision contained between the umbilicus and symphysis pubis is technically called a short incision, and one extended above the umbilicus a long incision. Should it be found needful to prolong the wound to a point above the umbilicus, the incision is usually carried to the left of the navel and brought back in a curved line to the linea alba. This is done to avoid the round ligament of the liver and its vessels, which come in there from the right side. Keith, however, cuts directly through the navel; and I find this straight incision to be superior in every respect to the curved one. Other things being equal, the short incision is safer than the long one; but it is a good rule to have an

opening large enough for easy manipulation and for the easy withdrawal of the cyst. For instance, a large monocyst without adhesions, after being emptied, can, like a wet bag, be pulled out, hand over hand, through a very small opening, whereas a much smaller polycyst, which cannot be wholly emptied and which is more or less adherent, will need a long incision. I once removed an oligo-cyst, weighing one hundred and twelve pounds, through an incision barely admitting my hand; while I had to open the abdominal cavity from ensiform cartilage to symphysis pubis in order to remove a solid ovarian fibroid tumor weighing but eighteen pounds. Both patients recovered, but the chances were, of course, more against the woman with the long incision. To avoid the escape into the abdominal cavity of any blood from the wound, and to prevent the soiling of the operator's hands, a clean napkin wetted with the carbolated water may be doubled over each edge of the incision.

Whenever the cyst-wall in the line of the incision is glued by adhesions to the parietal peritoneum, the latter is liable to be mistaken for the former, and accordingly to be stripped off from the abdominal wall. Although I have always been very careful not to make this mistake, yet in my two hundred and seventh case of ovariotomy I stripped off the peritoneum for about a hand's breadth from the whole edge of the wound before I discovered what was being done. Fortunately, the patient recovered. To avoid this very serious error, either proceed with the cutting until the cyst-wall unmistakably comes into view or is opened, or else extend the incision upward until a point is reached where the cyst is free from adhesions. Adhesions binding the cyst to the abdominal wall are of importance only from the troublesome oozing their rupture often gives rise to. To lessen this risk, they are to be sundered by sponge-pressure or by the fingers whenever possible. Should the scissors be used, the adhesion bands must be snipped close to the surface of the cyst, and not to that of the abdominal wall. Thus, a free end is gained, which may, if needful, be subsequently tied, or in which the dangling blood-vessels may the more readily constringe. All thick and long bands of adhesion should be tied in two places, and be divided between the ligatures. These ligatures should consist either of very fine silk or of gut. For isolated vessels the latter are the better ones, but the silk is more suitable for tying en masse a group of bleeding vessels or for pursing up an oozing surface by an in-and-out stitch. A very important rule, on the observance of which one's success greatly depends, is, never to let a bleeding point or an oozing surface get out of sight. It must either be ligatured at once, or else caught by pressure-forceps and tied later if needful. If the delicate omental apron be found glued to the cyst, it should be carefully detached with as little tearing and splitting as possible, for each shred will bleed, and so will

the fork of the split. It should then be turned out of the abdominal cavity on a clean napkin wetted with the carbolated solution. If its bleeding vessels be few, each one may be tied with gut; but if they are many, the torn portion of the omentum should be tied en masse or in sections, and the ligatures cut off close to the knot. No rent should be left in the omentum into which a knuckle of intestine might enter and be strangled. It should either be tied off or sewed up. All shreds and ragged ends must be trimmed off, and the omentum is then returned to the peritoneal cavity.

Tapping and Removing the Cyst.—When all the adhesions within reach, and those that do not demand great force, have been severed, it will be time to tap the cyst. This should be done with a large-sized trocar, such as Wells', which is furnished with spring teeth to prevent it from slipping out of the cyst. Any trocar will do, provided it has a large bore, so that the vent may be free, and that none of the acrid fluid can escape along its side into the abdominal cavity. In order to save time, Martin and other German operators do not use a trocar. They incise the cyst, and try, by turning the woman on her side, by lateral pressure, and by traction on the cyst-wall, which then fills up the abdominal incision, to direct the contents externally. Frequently, however, some of the fluid escapes into the abdominal cavity, but they contend that if antiseptic precautions are taken no harm accrues.[1] Although dissenting from this opinion, I must confess to having had some of the contents of the cyst escape repeatedly into the abdominal cavity without doing any harm whatever. But then I always irrigate the cavity and wash it out with an abundance of pure warm water. Drs. Lane and Macan report a case in which they became affected with boils and abscesses on their hands after removing an ovarian cyst. Yet, although "a considerable quantity of the fluid got into the peritoneal cavity," the woman got well.[2]

Always tap at the upper angle of the wound, because as the cyst collapses the trocar is drawn downward toward the lower angle. Hence, were the trocar entered low down, it could not travel with the collapsing cyst, which would therefore slip off. While the fluid is flowing, flat sponges should be packed in between the abdominal wall and the cyst, and the edges of the incision should be pressed firmly against them, so that the peritoneal cavity may not receive a single drop of that which frequently escapes along the side of the trocar. To avoid this accident—which, without being a very serious one, is yet not to be invited—some ovariotomists, before tapping, turn the woman well over on her belly and over the edge of the table; but this is liable to cause a protrusion of the bowels; which is, in fact, a more dangerous accident than the entrance of some of the fluid into

[1] *Berlin. klin. Wochenschr.*, 1883, No. 10. [2] *Brit. Gyn. Journ.*, May, 1887, p. 92.

the abdomen. Rosenbach, indeed, reports that during the extraction of biliary calculi through an abdominal incision a cure resulted, although several calculi were lost in the peritoneal cavity.[1] Should the mother-cyst not collapse, on account of its containing a few other large cysts, the point of the trocar, without being withdrawn, can be made to enter each one. But if the daughter-cysts are many and small, the trocar is withdrawn, the opening enlarged, its edge seized by several pressure-forceps, and the hand introduced to break up these cysts.

Before this hand can again be used for separating adhesions it must be carefully cleansed with soap, and dipped into the carbolated solution in the tray of instruments.

The empty cyst is next gently pulled out through the abdominal wound. It is, however, so slippery that this cannot ordinarily be done with the hands alone. A strong forceps with a firm grip is needed, and one of the best is Nélaton's. While the cyst is being withdrawn the bowels are sheltered from the air and from the spray, if directed on the wound, by one large flat sponge, and the abdominal cavity must also be packed with smaller ones at every exposed point; and one of them should always be placed between the womb and the bladder.

In the majority of cases there is not much difficulty in freeing the cyst from its ordinary attachments and in reaching its pedicle. But should adhesions bind the cyst to the adjacent viscera, matters will not go on so smoothly. Such adhesions to bladder, liver, bowels, or to other important organs sometimes present difficulties which are insurmountable. The problem here is to sever these bands of adhesion without injuring the viscera to which they are attached. If the adhesions are recent, they can usually be sponged off, the sponge at the same time absorbing the blood. When these adhesions are numerous or very firm, much advantage will be gained by having the assistant put his hand within the cyst and stretch its wall, while the operator severs the adhesions over it. By this means the adhesions can be better broken off close to the cyst, which is the all-important course to pursue in visceral attachments. Sometimes it will be needful to peel off the outer and non-secreting layers of the cyst and leave them behind—sometimes to cut off the adherent portion of the cyst and scrape off or strip off its secreting surface. Whenever the stalk of the tumor can be reached before all the adhesions are severed, it is well to catch it with one or two pressure-forceps, or even to tie it and cut it off between two ligatures, like the umbilical cord. This will prevent bleeding from the torn surfaces of the cyst. When the cyst is closely adherent to the edges of the abdominal incision, either extend the wound upward until a free point is reached, and work downward on the adhesions, or else cut into the cyst, empty it, and seize with strong forceps its inner sur-

[1] *Medical News*, Feb. 3, 1883, p. 130.

face just beyond where the adhesions begin. The sac is then inverted by traction, which will break up its adhesions to the abdominal wall, the last portions to be freed being those attached to the edges of the incision. This prevents the stripping off of the peritoneum. Should the appendix vermiformis be so adherent to the cyst as not to be detached, it must be ligated in two places, between which it is to be cut, in order that its contents may not escape into the abdominal cavity. The fecal plug in each distal end should also be carefully squeezed out. Double ovarian cysts sometimes fuse together, and, rupturing at the point of fusion, form apparently one cyst. Such a cyst will have two pedicles, and will be very puzzling to the inexperienced operator. As the cyst is being detached, pack sponges in every gap left behind in the abdominal cavity.

Treatment of the Pedicle.—When the cyst has been freed from its attachments and turned out of the wound, the very important question comes up of the treatment of the stalk or pedicle. Shall it be secured by a clamp? shall it be burned off by the actual cautery? or shall it be tied, cut off, and dropped back? The first is called the extra-peritoneal method; the others, the intra-peritoneal. For many years the clamp claimed the most advocates, but it has lost ground on account of possessing the following disadvantages: By keeping the wound open it prevents a strictly antiseptic treatment; the stalk sometimes sloughs below the line of constriction, and conveys putrilage into the abdominal cavity; the stalk always becomes united to the abdominal wall; hence, when it is short, the womb is dislocated or it is too much dragged upon. Then, again, in one-third of the cases the oviduct has a trick of remaining open, and the woman will menstruate indefinitely from the abdominal cicatrix. This is owing to the fact that the clamped portion sloughs off too early for a firm plug of cicatricial tissue to be formed, and the oviduct is therefore liable to stay open. In my first case of ovariotomy this happened, and one year later the cicatrix degenerated into a malignant growth, which destroyed the life of my patient. It is, however, probable that in this instance the cystic disease of the ovary was malignant, although the sac did not look so at the time of its removal. Another disadvantage arising from the use of the clamp is the subsequent weakness of the cicatrix at its site, and the liability of ventral hernia to form there. These are the objections to the clamp, and they are so valid that, at the present time, all distinguished ovariotomists have abandoned its use. Koeberlé, who was the last to relinquish it, had up to 1880 a mortality with it of 11 per cent. Since then he has had 74 cases, with 5 deaths.[1]

The actual cautery, performed by Paquelin's instrument or by platinum-tipped irons, which do not scale off or discolor the tissues, is

[1] *Revue de Chirurgie*, 1885.

theoretically the very best way of dealing with the stalk. No foreign body, except the charred portion of the stalk, is left within the abdominal cavity; but, on the other hand, it cannot always be trusted to close the vessels. On this account it is looked upon with disfavor by all ovariotomists, with the exception of Keith. His method is as follows: The pedicle is spread out evenly within Baker-Brown's clamp, so as to get equable compression. The cyst is cut off, leaving a stump about an inch in height above the clamp. To protect the parts from heat, a folded napkin wetted in the carbolated solution is tucked under the clamp. The stump is next carefully dried, and then burned slowly down to the level of the clamp by wedge-shaped cautery-irons at a brown heat. They give off a whistling sound during the process. The thick end of the stump may be more quickly burned down, but the thin end should be burned very slowly, and the blades of the clamp, by prolonged contact with the cautery-iron, must also be made hot enough to dry and shrivel up that portion of tissue which they compress. In order not to disturb the stump after it has been cauterized, it is best to clean out the peritoneal cavity first, and to leave this treatment of the pedicle for the last thing. Before removing the clamp, which is to be unscrewed very slowly and carefully, one side of the pedicle is seized by a pressure-forceps, by which it is kept in sight and out of harm's way if the peritoneal cavity needs further cleansing.

The plan of treating the pedicle most in vogue, and the one which I adopt, is that of the ligature—one of fine carbolated silk, the finest compatible with safety. No. 4 is the size I usually employ. The ends are cut off close to the knot, and the stump is dropped into the peritoneal cavity, where the silk, being animal tissue, will in time become disintegrated and absorbed. Now, when I say silk, I mean silk, and not silver or gut ligature. Silver, being inelastic, cannot bind a shrinking stalk, while the gut is a treacherous ligature, and will sooner or later bring one to grief. It slips in the tying, it is liable to untie, it gives instead of shrinking, and it is too short-lived for the obliteration of large vessels.

The reasonable objection has been urged that, since the abdominal cicatrix left by the use of the clamp is liable to reopen every month to give vent to menstrual fluid, the same phenomenon will, by this intraperitoneal method, happen within the abdominal cavity, and expose the woman to all the risks of a hæmatocele. But fact is here opposed to theory, for it has been found that either the oviduct in the stump atrophies into an impervious cord of fibrous tissue, or that its raw end, by contracting adhesions with the surrounding tissues, becomes hermetically sealed. It might also be supposed that the distal end of the ligatured stalk would slough and expose the woman to septic peritonitis. But such sloughing rarely happens, and for the following reasons: From

shrinkage of the stump the constriction is lessened, and the capillary circulation is re-established; or the peritoneal surfaces, on each side of the narrow and deep gutter made by the fine silk, will bulge over and touch one another. Adhesion then takes place between the two, and the blood-vessels which shoot over from the proximal, or uterine, side of the ligatured stump will carry life into the distal end; or lymph, exuded by the irritation of the ligature, will throw a living bridge across the gutter in the stalk; or, what is the least desirable, the raw end of a long stalk glues itself to any peritoneal surface with which it may come in contact. I say least desirable, because sometimes such an adhesion makes a kink in the bowel, and may so constrict it as to give rise to fatal obstruction. To prevent this accident, Thornton stitches with gut the raw end of the stump to the broad ligament, to which it adheres; while Bantock catches it up out of harm's way by including it in the lowest abdominal suture, which, being of silkworm gut, can be left in for a long time. If the stump be short, it stands upright, and does not then need this treatment.

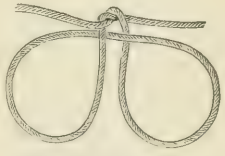
If the stalk be a thick one, it is transfixed by a blunt needle, or by an aneurismal needle threaded with a double ligature, and is tied on either side, each half by itself, and then the whole is further tied by the free ends of one of the ligatures. The "Staffordshire knot," recommended by Tait, may also be used. If the stalk be a broad one, it is tied in three or more sections by cobbler's stitches. If very thick or broad, it is a good plan to catch the stalk in Dawson's clamp, which compresses it circularly, and to transfix and tie it in the furrow made by the clamp. This lessens the risk of secondary hemorrhage, which is usually caused either by the slipping off of the ligature or by its loosening through tissue-shrinkage. When this clamp is used, the pedicle need not be tied until the wound is ready to be closed. The stalk must be cut off at a distance from the ligature of not less than three-fourths of an inch, so as to leave a button of tissue sufficiently large to prevent the loops from slipping off. In short and broad stalks the outer or broad ligament portion, which is thin and membranous and sustains most of the tension strain, is liable to slip out of its loop and cause a fatal hemorrhage. To avoid this accident, the ends of the corresponding ligature may, before being tied, be repassed in opposite directions through the stalk very near its margin, so as to form the cobbler's stitch. Another way is to pass a fine silk thread through the thin portion of the stalk, about one-third of an inch from its edge, and tie it. In the notch thus made, and below the knot, is laid and tied the outer ligature.

In anæmic cases Thornton ties the arterial side of the pedicle first, but in young and vigorous women he ties the venous side first, so as to deplete the woman by gorging the tumor with blood. While the

cyst is being cut away, the abdominal cavity must be so protected by sponges that not a drop of blood shall fall into it. A dilated oviduct in the pedicle tends to suppurate; hence, in such a case, the ligature should be applied as close to the womb as possible, so as to get below the expanded portion. Before the cyst is cut away, the pedicle should be seized on one side by a pressure-forceps, and kept more or less in sight until the wound is ready to be closed up. This will also prevent the ligatures from being rubbed off by the sponges while the abdominal cavity is being cleansed.

The "Staffordshire knot" (Fig. 288) is made as follows: The pedicle is transfixed by an aneurismal needle armed with a double thread. Into the loop of this thread are passed the ends of the ligature, which has been laid on the abdomen loosely around the pedicle. The needle, upon being withdrawn, brings with it these two ends of the ligature, which will now lie above their own loop. One of these ends is passed under this loop, and a square knot firmly tied. The free ends are now thrown around the pedicle and again tied. Thus, it will be seen that this mode of securing the pedicle accomplishes by two knots what the ordinary double ligature effects by three knots.

FIG. 288.



The Staffordshire Knot.

The ligatures which have been applied to the pedicle or to adhesions either become encysted or in time disappear by absorption; but sometimes they behave like foreign bodies, and are discharged by an abscess opening usually in the abdominal wound. This happened to two of my cases, without, however, doing harm. A stubborn fistulous opening, following an abscess in the wound, should always lead to the suspicion of the presence of a ligature. Dr. T. Keith[1] and Dr. J. H. Thompson of Rome, Italy, each report a case in which the ligature was passed by the urethra. M. Quenu had a case in which more than a dozen silk ligatures came away per vaginam.[2]

In some exceptional cases the pedicle is so short or so rotten that neither the ligature nor the cautery can be used. The vessels in the pedicle must then be secured by several pressure-forceps, the handles of which, emerging like a drainage-tube from the lower angle of the wound, are to be tied together. After the lapse of forty-eight hours they are to be removed, but with great care.

The sac having been removed, the other ovary should be examined, and, if diseased, be tied and cut off. From the sundered bands of adhesion more or less bleeding has been taking place, which must now be attended to. It can usually be stopped by pressure with a sponge

[1] *Contributions to the Surgical Treatment of Tumors of Abdomen*, p. 17.

[2] *Archives de Tocologie*, Jan. 15, 1886, p. 28.

or with a finger, or with sponges wrung out of very hot carbolated water. For single vessels torsion will usually succeed, but, if it does not, fine carbolated silk or gut ligatures must be used; and it is wonderful how many can be applied without materially compromising the safety of the woman. I once tied over thirty vessels in a lady sixty-eight years of age, who recovered without any symptoms of peritonitis. The free ends of the ligatures should always be cut close to the knot. Stubborn oozing surfaces can very generally be stanched, by firm pressure with a sponge wrung out of very hot water, by searing them with Paquelin's thermo-cautery, or by passing a needle armed with fine silk under, and ligating, any vessel that may be detected leading up to the seat of the oozing. In some cases nothing answers so well as the pressure of the finger moistened with alcohol or with a drop or two of the ferric subsulphate or of the tincture of iodine. In oozing from inaccessible points in the pelvis, a sponge dipped in the undiluted solution of iodine, or in Monsel's solution of iron, and afterward well squeezed out, may be pressed firmly down for a few moments into Douglas' pouch. I have applied the ferric subsulphate—viz. Monsel's solution—repeatedly to oozing surfaces, and I have never had any occasion to regret its use. It blackens the tissues that it touches, but it does not seem to inflame them. I apply it unhesitatingly to the bleeding surface of the bladder, of the womb, of the intestines, and of the abdominal wall; but I take care that only enough for the purpose is used, and no more. When the oozing comes from a large surface of the abdominal wall, it may finally be arrested by the doubling of the raw surface on itself. The fold thus made is then secured either by a long acupressure needle or by cobbler's stitches passed through from skin to skin. Forty-eight hours after, this needle or these stitches should be removed. For this ingenious device we are indebted to the late Dr. Kimball of Lowell, Mass. Should all these measures fail, put in a drainage-tube, close up the abdomen in the manner about to be described, and temporarily lay over the dressings some heavy weights, such as bags of sand or of shot. This plan I have not been obliged to resort to, but it has the sanction of Nussbaum, who uses two large bricks, and it is worthy of being borne in mind.[1] In my hands an elastic flannel binder, pinned very tightly over a large pad of cotton wool, has made pressure enough to check the hemorrhage.

The Toilet of the Peritoneum.—By this is meant the peeling off from the peritoneum of plastic deposits, the removal of the sponges packed into its cavity, and the careful cleansing away of all fluids and of every blood-clot. In the search for all such foreign bodies, or, indeed, for obscure oozing-points, the portable electric light or the reflector of the ophthalmoscope or Colin's illuminating lamp will

[1] *British Med. Journal*, Oct. 26, 1878, p. 617.

give much aid. When some of the contents of the cyst have escaped into the abdomen, or when much oozing has taken place from extensive adhesions, the peritoneal cavity must be washed out with warm water which has previously been boiled. Quart after quart is to be poured in, and paddled about with the hand until it returns clean. This can be readily done when a large tumor has been removed and there is plenty of room. But when the tumor is of small size and the incision short, the peritoneal cavity is best cleansed by a drainage-tube fastened to a fountain syringe, or by the vaginal nozzle of the Davidson syringe. Douglas' pouch, and the peritoneal fold between the bladder and the womb, are favorite localities for the collection of blood or of serum, and should therefore be thoroughly mopped out by small sponges on holders, otherwise peritonitis or septicæmia may result, which are the two great factors of death in unsuccessful cases.

Closure of the Wound.—When this has been thoroughly done, a clean sponge is placed in Douglas' pouch, another in the sulcus between the bladder and the womb, and a third, a large and broad flat one, is laid over the intestines under the wound, to catch the blood that may drop from the needle-tracks. Each needle is passed from within outward, a quarter of an inch away from the peritoneal edge of the wound, and is made to emerge at the same distance from its cutaneous edge. If the recti muscles are included in the sutures, there is said to be a liability to the formation of abscesses in the suture-tracks. Hence, Wells advises that the peritoneum and skin should be pinched together, and that the needle should be passed through them alone without perforating the muscles. Yet I believe that from a too close observance of this rule come many cases of hernia in the tract of the wound, and that were the recti muscles more closely coaptated they would not recede from one another, and thus aid in the formation of a rupture. My own rule is to include these muscles in the suture whenever they are exposed to view. The sutures should lie about one-third of an inch apart. The needles should be lance-pointed and held by a needle-holder. In fat women it is not always easy to get the two surfaces of the wound in exact coaptation; consequently, more or less puckering and eversion of the edges may take place. To avoid this, it will be well, before passing the needles, to bring the edges of the wound together, and make, with a fountain-pen, transverse lines at proper intervals across the incision as landmarks for the introduction of the sutures. These cross-lines are also of advantage, whenever the abdominal walls are too tense for accurate coaptation, as after oöphorectomy, after the removal of a small abdominal tumor, or after an exploratory incision for a solid tumor which cannot be removed. In these cases, indeed, it would be well to make the cross-lines the first step of the operation, before even the abdominal incision has been made.

The reasons why the needle is made to enter the peritoneum first are, that the stitches are lodged more evenly on that vulnerable surface, and with less injury to it, such as the stripping of it off from the abdominal wall; and, further, that a stray knuckle of bowel is not so likely to be wounded by the upward as by the downward thrust of the needle. The object of including the peritoneum in the stitches is to bring in contact two long and narrow ribbon-like surfaces of a membrane, which will quickly unite—so quickly as to forestall any formation of pus in the overlying issues, and to bar the entrance of this or other septic fluid from the wound in the abdominal wall. Another advantage is, that this inclusion of the peritoneum, by presenting an uninterrupted surface of parietal peritoneum to the visceral peritoneum, prevents the adhesion of the omentum and of the intestines to the internal lips of the wound, which otherwise takes place.

Through fear of the formation of ventral hernia, some very excellent operators in this country close the wound by three tiers of sutures. First, the peritoneum is brought together by a continuous gut suture; next, the linear edges of the tendon forming the linea alba are sewn up in the same way; finally, the cutaneous surface of the wound is closed by deep sutures of silk or of wire, which reach the peritoneum, but do not go through it. The objections to this treatment are, the precious time spent in making it, and the doubt as to its utility. Since placing the sutures very closely together—viz. three to the inch—I have had but a single case of ventral hernia. But in very fat women, in whom it is not easy to get perfect coaptation of the whole depth of the wound, I should be disposed to resort to the three tiers of sutures. Yet, according to Tait, "hernia happens in the practice of every one, no matter how the wound be stitched."[1]

As the tissues of the umbilicus are very thin, and liable to form a hernial protrusion, either their peritoneal edges should be first united by gut sutures, or else the navel itself should be wholly excised.

When a ventral hernia already exists, its sac should be dissected out, and the superfluous and attenuated walls should be removed by two elliptic incisions. The edges are then to be brought together by the three tiers of sutures.

After the removal of a very large tumor there often remains, between the separated recti muscles, a wide area of thin tissue consisting merely of skin and of peritoneum. This, if left, makes a pendulous belly, greatly weakens the retentive power of the abdomen, and is a never-ending source of annoyance. It, therefore, should be removed by the scissors, in one long band on each side of the abdominal incision.

When all the sutures have been passed, their ends on one side are loosely twisted together into a single strand, which is securely caught

[1] *Brit. Med. Journ.*, May 15, 1886, p. 923.

by a pressure-forceps. The same thing is done with the ends on the other side. A finger of each hand is now passed down into the centre of the wound, and the upper sutures are separated from the lower ones by their being drawn to opposite angles of the wound. This permits the removal of the sponges, and, if they are stained with blood, the further search for some overlooked bleeding vessel. To guard against twisting of their convolutions, the bowels, still further disturbed by these final manipulations, are now restored to their natural position, and the omentum, after being again examined for some bleeding vessel, is gently spread out over them. The forceps and sponges are then counted, to see that not one has been left in the abdominal cavity. The importance of this cannot be too strongly impressed upon the operator, for distinguished ovariotomists have overlooked these articles, and have left them behind in the abdominal cavity—a sponge and a bulldog forceps in one case.[1] Tait has heard of ten such cases.[2] It is, indeed, sometimes no easy task to find a missing sponge when lost in the convolutions of the intestines. The sponges, therefore, should not be much smaller than the fist. Should the incision be a long one, the flat sponge, placed over the bowels to catch the blood from the suture-tracks, need not be removed until the wound is nearly closed up.

Before closing the wound the operator removes the pressure-forceps, and catches in one hand all the ends of the sutures on his side; his assistant does the same thing on the other side, and the edges of the wound are brought together by a firm pressure, which also chases the air out of the abdominal cavity. To stop the bleeding from the needle-tracks as soon as possible, each suture is rapidly tied, and by the surgeon's knot. When the whole wound has been closed, and not till then, the ends of all the sutures are gathered together in one hand, and they are cut off about two inches from the knot by one snip of the scissors. This saves precious time, which would be lost were each suture by itself to be cut after being tied. At gaping points of the wound intermediate superficial stitches should be put in. In fat women several such stitches will usually be needed.

Dressing of the Wound.—After the wound has been closed, the rubber apron is removed and the abdomen cleansed and dried. The wound may now be dressed according to Lister's plan. This consists—first, of a narrow protective of prepared oiled silk, moistened by a 1 : 40 solution of carbolic acid; next, of one broad layer of antiseptic gauze wetted with the same solution; and over this eight folds more of the

[1] *Lancet*, May 26, 1877, p. 783; Jan. 9, 1886; *Brit. Med. Journ.*, Jan. 28, 1882, p. 115; *ibid.*, Dec. 25, 1880; also *Ovarian and Uterine Tumors*, by Spencer Wells, London ed., p. 336; H. P. C. Wilson, in *Trans. Am. Gyn. Soc.* for 1885; Doran, in *Gynecological Operations*, p. 238; *Journ. Am. Med. Assoc.*, Jan. 10, 1885, p. 50; *Medical News*, Feb. 21, 1885, p. 218.

[2] *Diseases of the Ovaries*, by Lawson Tait, 4th ed., p. 261.

dry gauze, having a piece of mackintosh interposed between the seventh and the eighth layer. The lamp is now blown out, and, the spray-jet being turned away from the abdomen, the dressing is secured by an elastic flannel binder, the rucking of which can be prevented by tapes pinned to it around each thigh. Most of the leading ovariotomists, however, employ simpler dressings, which have been found equally antiseptic. Wells covers the wound with a dry dressing of thymol cotton, kept in place by long strips of adhesive plaster going two-thirds of the way around the body. Over all is pinned a flannel binder. The thymol cotton is prepared by steeping absorbent cotton wool in a solution of one part of thymol to one thousand of water, and drying it. Keith dresses the wound with gauze wrung out of a 1 : 8 glycerole of carbolic acid. On this are laid several layers of dry carbolated gauze, next some cotton wool, and over all a flannel binder. Thornton uses Lister's gauze and the mackintosh, but without the protective. This dressing is secured by adhesive straps. On these are laid several folded napkins, and over all a flannel binder is pinned very tightly. Bantock resorts to dry absorbent gauze. Tait uses nothing but ordinary absorbent cotton. Salicylated cotton I have found to answer so well that for years I used nothing else. It is made by steeping two parts of absorbent cotton in a solution of one part of salicylic acid to two of commercial ether, and afterward drying the cotton by a low heat. Lately, I have been trying Keith's dressing, after first dusting the wound with iodoform, but it probably possesses no greater advantages. Over this dressing is laid a large pad of raw cotton, which has been made aseptic by being baked in an oven. This is secured by adhesive straps, the best being made of rubber plaster. These straps should never meet or overlap on the back, but they should be as short as possible, so as not to impede distension from flatus.

The flannel binder having been pinned on, the night-dress is pulled down and the patient put to bed. The six bottles of hot water are applied to different portions of the body, and she is covered with warm blankets. The tables, tubs, and other articles used in the operation are now removed, the room is darkened, and she is left alone with her nurse, who has positive instructions to admit no one besides the physician.

Drainage.—When blood in small quantities is effused into the peritoneal cavity, coagulation usually takes place, the serum is then absorbed, the clot becomes organized, and no harm results. But when blood in large quantities collects in Douglas' pouch, it may behave as a foreign body and cause mischief. When, also, blood is mixed with serum, coagulation is not so likely to take place; the blood-corpuscles then are liable to break down, the fluid to become putrid, and septicæmia to set in. For these reasons the removal of

these fluids by different modes of drainage has long been put in practice. The best mode is by a glass tube passed down to the bottom of Douglas' pouch through the abdominal wound, and not, as has been recommended, through a special opening made for it in the roof of the vagina. Drainage is at present very rarely resorted to by those operators who use strict antiseptic precautions, for they contend that septic changes in the blood do not then take place. Wells and Olshausen have virtually given it up; Thornton and Meredith, who both use the spray, resort to drainage occasionally; while Keith, Tait, and Bantock, who have abandoned Listerism, are warm advocates of it. This question is a very important one, because a drainage-tube tends to the formation of a ventral hernia, and, being a foreign body, is in itself hurtful, and therefore should not be resorted to unless it will do more good than harm.

After a careful consideration of the subject, I am forced from experience to believe that between the two extremes there lies a golden mean, and that drainage, even when the spray is used, is needed under the following conditions:

(*a*) Whenever a purulent or a colloid cyst has burst, and its contents have escaped into the cavity of the abdomen, either during the operation or some days beforehand.

(*b*) Whenever the contents of the cyst are putrid or purulent, and septic symptoms or those of peritonitis are present.

(*c*) Whenever a large amount of ascitic fluid is found in the abdominal cavity, or the latter is infected by papillomata.

(*d*) Whenever all oozing cannot be stopped, or whenever four drachms or more of pure blood, or especially of a sero-sanguinolent fluid, can be squeezed out of the sponge in Douglas' pouch when removed just before the closure of the wound. But it must not be overlooked that the mere irritation from this sponge will cause the exudation of a pale-red serum, which does not imply the need of drainage.

(*e*) Whenever there are extensive adhesions in a person advanced in life, or whenever it has been deemed needful to cleanse the peritoneal cavity by irrigation.

(*f*) Whenever the operator is in doubt what to do.

Should it be deemed needful for some of the above reasons to make use of drainage, a glass tube, open at both ends and about six inches in length, is passed through the salicylated cotton or other dressing, then between the two lowest stitches, down to the bottom of Douglas' pouch. A wire suture is first introduced between these sutures and left untwisted, its object being to close firmly the opening left by the removal of the tube, and to hasten its union. Otherwise, a weak cicatrix results, tending to the subsequent formation of hernia. Keith's drainage-tube of three sizes is the one that I prefer. Its lower end is perforated with

holes, and its upper end has a shoulder, which keeps it from slipping into the abdominal cavity, and also enables it to hold a piece of thin rubber sheeting about eighteen inches square. In the centre of this a small circular hole is made, which, by stretching, is sprung over the tube. The mouth of the tube is covered by a cup-shaped sponge wrung out of a 5 per cent. solution of carbolic acid, and over this the rubber sheeting is folded four times. The flannel binder may either be pinned loosely over the drainage-tube, or else it may be slit at the tube and passed on each side of it, leaving the sponge and rubber sheeting outside of the dressing. They are then best held in place by a separate strip of flannel, so as to permit inspection without interfering with the main dressing; but pressure must not be put on the tube. Several times a day the sponge is removed, squeezed out, cleansed in a 5 per cent. solution of carbolic acid, and replaced. This in a general hospital had better be done under the spray. Bloody serum collecting in this tube is sucked out—every two hours at first—either by a fine rubber tube attached to a syringe, or else by the long nozzle itself of the ordinary uterine syringe. Some surgeons recommend that sterilized wicking, or a twisted roll of antiseptic gauze, be put in the tube, to exhaust the fluid by capillary attraction.

Whenever hemorrhage is indicated by the escape of pure blood from the tube, the blood must be sucked out every few minutes, until it ceases to flow. This, by keeping the bleeding point dry, favors coagulation, and the tube thus becomes an excellent hæmostatic. In three cases Tait arrested the hemorrhage by a "timely injection of a solution of perchloride of iron through the drainage-tube on to the bleeding surface."[1] But this heroic treatment can be resorted to only in cases of oöphorectomy, or of those of ovariotomy in which the adhesions were pelvic. In all other cases the wound will have to be reopened, and the bleeding vessels searched for.

As a rule, unless the drainage-tube is inserted into a sac, or unless the discharges from it become offensive, detergent injections should not be made into it. The best injections are 5 per cent. solutions of carbolic acid or of sulphurous acid, and a 1 : 2000 solution of corrosive sublimate.

A drainage-tube can drain the whole peritoneal cavity for probably not more than eight-and-forty hours, because by that time it will have become encapsulated by the surrounding intestines through adhesive inflammation. It will, however, drain the pelvic basin for a longer period of time, and it is therefore of special advantage in cases of small tumors—such as in oöphorectomy—and in cases of a large tumor in which the adhesions were limited to the pelvic region.

[1] *British Gynecological Journal*, Aug., 1887, p. 192.

During this process of encapsulation shoots of organizing exudation are liable to penetrate the lateral openings in the tube, and to grow rapidly to a remarkable size. When the tube is removed for good, these imprisoned growths will necessarily be forcibly torn off, and cause hemorrhage and local injury. I have known several instances in which, from this cause, the surgeon had much difficulty in removing the tube. To avoid this misadventure, the tube should be turned completely round on its long axis at least once a day.

In order to prevent undue pressure upon the rectum, with consequent sloughing and the formation of a fecal fistula, of which several cases have been reported,[1] the tube must be lifted up at each dressing about half an inch, and allowed to slip back of its own accord. It should also, whenever practicable, be changed for a shorter one. If the tube is to remain in any length of time, a rubber one had better be substituted for the glass one.

The drainage-tube is to be removed whenever the discharge has been reduced to not more than one or two drachms of clear serum; and this usually happens within the first forty-eight hours. After its removal the opening left in the wound is closed by twisting the free ends of the wire suture placed there for this purpose.

After-Treatment.—The subsequent treatment needs the greatest attention. The first care is to establish reaction. This is best done by heat, and by stimulants, such as brandy and whiskey given in iced soda-water. Enemata of beef-tea and brandy, or of milk and brandy, will also be of advantage, while artificial heat is kept up. For the vomiting, which comes partly from the anæsthetic and partly from shock, repeated deep inspirations should be tried. They help by getting the blood rid of the anæsthetic as soon as possible. Chloral or cocaine may also be given, or small lumps of ice may be swallowed. Sips of very hot water, or a tablespoonful every hour of a mixture containing equal parts of lime-water and of cinnamon-water, may also do good. A hypodermic of morphia will often allay vomiting, and I have seen it yield to small doses of atropia, and also to two grains of pure pepsin, given every two hours in a tablespoonful of raw-beef juice. An excellent combination is one of morphia, atropia, and sodium bicarbonate. Twenty drops of ether given by the mouth will sometimes relieve it, and so also will a few drops of chloroform confined by a watch-glass over the pit of the stomach. In some cases I have tried, with the best results, the following effervescent mixtures, recommended by Chéron:[2]

[1] *British Gynecological Journal*, Aug., 1887, pp. 194, 196; *General and Operative Gynecology*, by Hegar and Kaltenbach, 1st Amer. ed., p. 246; Alexander: *Medical Chronicle*, Oct. 1, 1887.

[2] *Archives de Tocologie*, Février, 1883, p. 122.

℞. Potassii bicarb.
Potassii bromidi, āā. gr. xxxij;
Aquæ, f℥ij. M.

℞. Acidi citrici, ʒj;
Syrupi, f℥j;
Aquæ, f℥iv. M.

A dessertspoonful of the former is added to a tablespoonful of the latter, and given every hour. For vomiting, especially of the bilious variety, Tait recommends Mason's pepsin wine, given every ten minutes in drachm doses with a little ice-water.

Flatus is another annoying symptom, which, however, can very generally be dispelled by turning the patient over on her side, and inserting a flexible catheter high up in the rectum. If this fails to relieve it, enemata of turpentine may be tried, or five-drop doses of the tincture of nux vomica may be given every two hours. Should the abdomen become painfully bloated, the binder must be loosened and the adhesive straps nicked in several places. The painful tension on the stitches can be relieved by drawing the knees up and supporting them over a pillow doubled on itself. Should the flatus not yield, or symptoms of obstruction set in, the bowels must be opened at all hazards. Seidlitz powders, castor oil, and Epsom salts are good cathartics for this purpose. When vomiting accompanies obstruction, calomel answers best, because it is not so liable to be rejected.

For the first twenty-four to thirty-six hours after the operation nothing whatever should be given to the patient by the mouth, excepting sips of hot tea or of hot toast-water or of barley-water, and an occasional teaspoonful of old whiskey. During this time, if the thirst be excessive, a pint of warm water may be thrown up the rectum. If the patient be anæmic, nutrient injections of beef-tea may be given every two or four hours, three ounces at a time. But it is well even then to spare the stomach as much as possible, especially for the first thirty-six hours. One teaspoonful of Johnston's fluid beef, dissolved in a cup of hot water, makes an excellent enema for this purpose. After that time tablespoonful doses of milk, of beef-tea, of thin and strained oatmeal gruel, or of barley-water, can be given every hour or two. The diet may then be cautiously increased, and especially after wind begins to escape from the rectum, the patient being enjoined not to hold it back from motives of delicacy. If the condition of the patient is such as to demand more nourishment, it had better be taken by the rectum. The urine should be drawn off by the nurse, unless the patient can, without much straining, pass it herself into a urinal. To avoid cystitis or an irritable bladder, each catheterization should be preceded by a cleansing

of the meatus and vestibule with a 1 : 2000 solution of corrosive sublimate, and the catheter should also be immersed in the same disinfectant. No anodyne whatever need be given unless called for by great pain, wakefulness, or restlessness; for opiates, by paralyzing the bowels, favor tympanites. They also make the secretion of urine scant, and they should, therefore, be avoided as much as possible. A hypodermic injection is the best way of giving an opiate. Should the body-heat indicate a temperature of 101° Fahr. or over, a bladder filled with broken ice, or, what is far better, a rubber ice-cap, should be kept on the head of the patient as long as it feels comfortable and does not chill her. If the temperature does not fall, and peritonitis or other septic symptoms set in, the bowels must be at once moved, either by calomel or by a saline cathartic, aided by enemata of soap-suds and turpentine. Ice should also be applied to the pit of the stomach. Quinia, morphia, and antipyrine must then be given in very large doses, preferably by the rectum, together with ten drops of the tincture of digitalis every hour, until the pulse-rate is lessened and the temperature falls.

The patient need not be kept rigidly on her back, but can be turned over on her side by the aid of the nurse. A pillow doubled on itself and placed under the knees is always a great comfort; and so are two beds, the one for the day and the other for the night. But if the patient is very heavy, it would be safer not to attempt to move her.

When five or six days have elapsed, the bowels should be opened; and, as this is a matter of importance, and is occasionally attended with symptoms of obstruction and with a good deal of constitutional disturbance, a few words will not come amiss. If the hardened feces can be softened down and dislodged by enemata, this is perhaps the best plan, clysters of ox-gall and water, or of glycerin and water, being the most efficient. But in my experience enemata have so often failed that I rarely resort to them in the first instance. If the woman's stomach is not irritable, I prefer to give her an ounce of castor oil. This is disguised in the compound syrup of sarsaparilla, in cold black coffee, or in some other suitable vehicle, as warm milk, and is brought to her, without any previous warning, early in the morning. Should it be deemed unwise to try the oil, two Lady Webster pills and two compound cathartic pills can be given at bedtime of the seventh day, or a pill containing three grains of the compound extract of colocynth with one grain of the extract of hyoscyamus may be swallowed every four hours. The compound licorice powder of the German Pharmacopœia, to which has been added potassium bitartrate, also answers well, provided the patient's stomach will bear teaspoonful doses every four hours. Should these remedies fail to act, they must be supplemented by enemata.

Fatal obstruction of the bowels from matting, or from constricting bands of organized lymph, caused by peritonitis, has been frequently reported. Thus far, I have met with two fatal cases, one of which, however, passed out of my hands after the operation. But occasionally I see cases of obstinate constipation which give me great uneasiness and put me to my wits' ends. In one case, after the failure of other remedies, the obstruction was overcome by broken doses of calomel combined with sodium bicarbonate, and by the distension of the lower bowel with very large enemata slowly given by the rectal tube. Another desperate case yielded to repeated doses of tincture of belladonna. A third case, complicated by obstinate vomiting, was saved by ten grains of calomel given every two hours until the bowels were moved. Seventy grains were thus administered before the desired effect was attained, yet salivation did not occur.

Tympanites is always the forerunner of obstruction. So, whenever it occurs, and wind does not escape by the rectum, it is an excellent plan to try the insertion of a rectal tube. If this fails, turpentine enemata or saline cathartics should next be resorted to, and without delay. When symptoms of obstruction slowly come on, relief is sometimes afforded, as Thornton suggests, by ten minims of liquor morphinæ hydrochloratis (B. P.), and by two minims of liquor atropiæ (B. P.), given every three hours, until the distension is relieved.[1]

In cases of obstruction resisting all treatment, it will be needful to reopen the abdominal wound, and search for the constricting point. But these cases usually end fatally, if the trouble arises during the first week.

When symptoms of obstruction once present themselves, they are likely to recur. The contents of the bowel should, therefore, be kept fluid, and for this purpose I know nothing better than the German compound licorice powder, given in teaspoonful doses at bedtime.

Suppression of urine sometimes follows ovariotomy, and in cases of diseased kidney is an alarming complication. It is due generally to shock, sometimes to poisoning from the carbolic-acid spray, and occasionally to the use of ether as an anæsthetic, when the kidneys are diseased or they act sluggishly. For this symptom digitalis and the acetate of potassium should be given. Thornton treats it by baring the arms and packing them in towels, which are kept wet with ice-water.

Tetanus may destroy the life of a patient while convalescing from the operation of ovariotomy. J. M. Bennett and others report such cases.[2] The symptoms in Bennett's case first showed themselves on the sixteenth day, and the woman died two days later. Chloral in

[1] Doran: *op. cit.*, p. 265.

[2] *Lancet*, Dec. 3, 1881; Doran: *op. cit.*, p. 269; Meinert: *Annales de Gynéc.*, Janvier, 1887.

drachm doses, administered by the bowel in the yolk of an egg, is perhaps the only remedy from which any good can be expected.

Phlegmasia alba dolens of the lower extremities may occur. It happened in one of my cases, and was cured by frictions with belladonna and blue ointment and by firm bandaging.

Occasionally, a few days after the operation, without any septic symptoms whatever or without any marked rise in the temperature, the parotid glands grow tender, swell up, and run through a course precisely like mumps, ending in resolution. This complication has been met with so frequently by myself and others that it cannot be a mere coincidence, but must be due to a reverse sympathy between the ovaries and these glands. It does not appear to increase the risk of the patient, for recovery took place in all the reported cases, of which three occurred in my own practice.[1] Parotid bubo may also take place after ovariotomy, but this sign of blood-poisoning, being a general one, happens as well after other grave surgical operations and during the course of specific fevers. Yet, from the sympathetic relation between the parotid glands and the sexual organs, it seems to occur more frequently in the septicæmia following ovariotomy.

Acute mania sometimes follows ovariotomy, especially when both ovaries have been removed. The attack is usually temporary, but it sometimes ends in insanity, and even in death, as in one of my own patients. Keith, Thornton, Tait, Bantock, Bryant, A. Martin,[2] and other leading ovariotomists report analogous cases.[3]

Surgical After-treatment.—The dressings, being antiseptic, need not, as a rule, be removed until the day following that on which the bowels are moved—viz. on the eighth day. Every other stitch may then be removed, and especially all that are loose or are cutting the tissues. The wound is then washed with a 2.5 per cent. solution of carbolic acid, dusted with iodoform, and dressed anew with salicylated or iodoformed cotton. I usually find the first dressing so sweet that I am able to reapply the unsoiled portion of it for a second dressing. A clean binder is now pinned on, and the woman's clothing changed. Three or four days later all the stitches should be removed, the wound secured by narrow adhesive strips, and dressed as before. For fear of a weak cicatrix and the formation of a hernia at the site of the wound, the patient should not get out of bed until fully two to three weeks have elapsed, and should for several months wear some kind of close-fitting gored binder or abdominal supporter. On the other hand, Treves con-

[1] Wm. Goodell: *Transactions of American Gynecological Society*, 1885; also, S. Paget: *British Medical Journal*, vol. i., 1887, p. 613.

[2] *Pittsburgh Medical Review*, January, 1888, p. 5.

[3] *The British Medical Journal*, March 21, 1885, p. 597, and March 22, 1884, p. 563; also, *Medical and Surgical Reporter*, May 29, 1886, p. 692.

tends that an abdominal supporter should not be worn after a laparotomy.[1] He says, "Muscle can be made strong only by use. If a belt be worn, the responsibility of supporting the viscera is thrown, not upon the abdominal muscles, but upon the instrument. The muscles are not encouraged to act. They are in the same position as the biceps when the arm is carried in a sling—wasting from disuse. To prevent a ventral hernia, the patient should not be allowed to get up too soon. A month in bed is not an unreasonable time. She should not get up until the wound is sound. She may wear a light flannel binder for a few weeks after she is about again, but at the end of that time she should discard supports of all kinds." This advice is, I think, sound, provided the patient is willing to stay a full month in bed; otherwise it is not to be followed. Nor should the patient, for six months at least, lift anything heavy, such as a scuttle of coal or a basket of clothes.

If, before the week is over, the dressings become soiled or give out a bad odor, they should be at once renewed. They should also be removed whenever a high temperature, without being accompanied by tympanites, leads to the suspicion of cutaneous abscesses.

Accidents during Ovariotomy.—When by the breaking up of adhesions to it the liver is wounded, the bleeding surface can usually be staunched, as Koeberlé has shown, by the ferric subsulphate applied to the raw surface by the finger. If this fails, the actual cautery at a dull heat should be used.

Should the gall-bladder be torn slightly, sew it to the abdominal wound and establish a fistula. If it is very badly torn, it should be wholly removed. With our present light, it would be deemed unsafe simply to stitch up a tear of this viscus.

The rectum has frequently been torn, especially in the enucleation of intra-ligamentary cysts, and also in the extirpation of adherent ovaries and oviducts in oöphorectomy. The wounded viscus being too deeply situated to be sewed up, a large drainage-tube must at once be inserted. The prognosis in these cases is by no means a bad one, for in most of the reported ones the whole contents of the bowel escaped through the drainage-tube, and the patient recovered. Tait,[2] Wells,[3] and Palmer[4] have met with this accident. Out of two of my cases, one died, but from the severity of the operation, and not from the tear in the rectum.

If, unfortunately, an adherent portion of the small intestines is torn open, the wound should be carefully closed with very fine silk by the

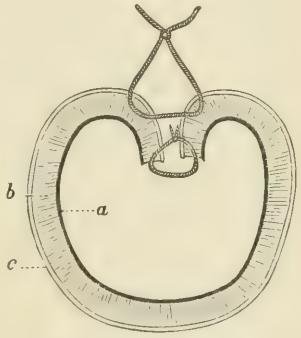
[1] *The Lancet*, Sept. 24, 1887, p. 604.

[2] *Medical News and Gazette*, May 17, 1884, p. 681; *Brit. Gyn. Journ.*, Aug., 1887, p. 193.

[3] *Brit. Med. Journ.*, 1878, vol. ii. p. 865. [4] *Medical Record*, June 6, 1885, p. 636.

continuous suture. The sutured portion is then fastened to the lower angle of the abdominal wound as a safeguard in case of the subsequent formation of stercoral fistula.[1] Should the intestine be injured to any extent, the wound must be closed by the Czerny-Lembert suture (Fig. 289), which consists of two sets of fine silk sutures—the first set, five to the inch, uniting the serous edges of the wound either by the continuous suture or by the interrupted one; the other set, six or eight to the inch, uniting one serous coat to the other, at a line about one-quarter of an inch distant from the wound, by the continuous suture. An ordinary cambric needle with fine sewing silk will answer admirably for this purpose.[2] In small wounds one continuous suture, carried through all the coats but the mucous, will suffice. A mere puncture can be closed by hooking it up and surrounding it by a single fine ligature.

FIG. 289.



Czerny's Suture: *a*, mucous membrane; *b*, muscular coat; *c*, serous coat.

Wounds of the bladder have frequently happened, but they are by no means necessarily fatal.[3] These accidents are liable to occur when the bladder, being adherent to the cyst and carried upward by it, lies directly under the line of incision, or the bladder may be torn open while adhesions to it are being severed. The wound should at once be grasped by a pressure-forceps, the bladder emptied by the catheter, and the operation proceeded with. When the operation has been completed the wound in the bladder is attended to, and in one of the following ways: Either the vesical wound is brought up within the lips of the abdominal incision, and is closed by being included in the abdominal stitches, or it is closed by the continuous or Glover's suture, without including the mucous membrane in the stitches. A self-retaining catheter, such as the Skene-Goodman, must then be kept in the bladder for at least a week.

Should the womb be badly lacerated, fine sutures will sometimes stop

[1] "Discussion on a Paper by Garrigues," *Am. Gyn. Soc. Trans.*, 1881.

[2] There is a misapprehension on the part of the profession with regard to the Czerny stitch. Czerny unites only the serous edges of the wound, and not the mucous edges, as is frequently stated. He has, however, quite lately sewed up the edges of the bowel by through-and-through stitches, including all the tissues—serous, muscular, and mucous—as in an ordinary wound elsewhere, such as the abdominal incision. The Lembert suture must not pass through the whole wall of the gut, lest gas or thin fecal matter should escape into the peritoneal cavity through the stitch-holes. It is more secure when it also includes the muscular coat.

[3] Eustache: *Arch. de Tocol.*, April and May, 1880, pp. 193, 277; *Boston Med. and Surg. Journ.*, Feb. 16, 1882, p. 153; *Brit. Med. Journ.*, Jan. 28, 1882, p. 115; *Am. Journ. Med. Sci.*, Jan., 1883, p. 123; Doran: *Tumors of the Ovary*, p. 74.

the bleeding. Should they fail, the wound should be seared by the thermo-cautery. Occasionally it will be needful to perform hysterectomy.

One of the ureters will sometimes be torn across while pelvic adhesions are being broken up. This accident is most likely to happen during the enucleation of a cyst enveloped in the folds of the broad ligament. It is almost always fatal, and is usually not discovered during the life of the patient, and, I am disposed to think, not often discovered after her death. Sometimes, however, urine will ooze out of the abdominal wound, and in rare cases the patient has recovered with a urinary fistula. In such a case Simon[1] successfully removed the corresponding kidney; Nussbaum[2] constructed an artificial ureter leading from the fistula to the bladder; and Tauffer[3] inserted the upper end of the divided ureter into the bladder by an artificial opening. It, however, failed to unite, and he later made an artificial ureter. If the ureter is, unfortunately, torn across, it seems to me that the best plan would be, either to bring the severed end out at the lower end of the abdominal wound, and secure it there, or else to make a hole in the bladder and sew into it the ureter, as Tauffer did. One operator, whose reference I have lost, at once removed the kidney on the corresponding side, and saved his patient.

In cases of ascites complicating ovariotomy, the ascitic fluid should not be wholly removed until the cyst has been cut off and the wound is ready to be closed. By this means any blood oozing from broken adhesions, or any fluid escaping from the cyst into the abdominal cavity, being diluted, is less likely to irritate the peritoneum, the cavity of which can also be more readily cleansed.

When a patient seems in danger of dying on the table from shock or from exhaustion, the anæsthetic should be withheld while hypodermic injections of ether and enemata of brandy are given. Warmth should also be applied to the body by bottles of hot water, or, what is better, by rubber bags of hot water. Theoretically, atropia administered subcutaneously would be the proper remedy, but I have not yet tested it. In all severe cases of ovariotomy, especially if the operation be prolonged, the woman should not be kept profoundly under the influence of the anæsthetic for any length of time, but should be allowed from time to time to come to, at least enough to make her flinch or move about. This caution should especially be observed in very feeble patients and in those with very large cysts. Transfusion will sometimes be of benefit. The transfusion solution of Mikulicz is approved by many surgeons. It consists of eight grains of sodium carbonate and one drachm and a half of sodium chloride, dissolved in

[1] *Ann. de Gyn.*, June, 1877.

[2] *Edin. Med. Journ.*, July, 1876, p. 1.

[3] *Arch. de Tocol.*, April, 1880, p. 201.

one pint of warm distilled water. Twelve ounces of this may be slowly transfused into the radial artery or the radial vein.

Shortly after the removal of the stitches, the abdominal wound will sometimes burst open. Fritsch,[1] Martin,[2] Bantock,[3] Doran,[4] and Terrier[5] report such cases. Every ovariotomist, indeed, has probably met with this very serious accident. Twice it has happened in my practice. In the first one, the stitches were prematurely removed, and on the next day the wound opened in its lower third. But the bowels did not protrude, and my patient's convalescence was uninterrupted. In my second case —one of oöphorectomy for a fibroid—the stitches were removed on the eighth day. Two days later, while she was drinking water, a few drops got into the trachea, and the violent fit of coughing which ensued burst open the whole wound. Even after the woman was completely anæsthetized, it was no easy task to return the protruding and swollen bowels, and to sew up the wound. She died a few hours later, apparently from shock. Whenever this accident comes from mechanical causes, the prognosis is favorable; but it is far otherwise when the edges of the wound are unhealthy, or septic tympanites is present. The difficulty then will lie in the return of the bowels. In some cases it may indeed be needful to lessen their size by puncture.

The Removal of Both Ovaries.—Whenever both ovaries are diseased there can be no question about their extirpation. But when only one has undergone cystic or other degeneration, the question of the removal of the sound one may come up. There always is a tendency to the subsequent degeneration of the sound ovary after the diseased one has been removed. More especially is this tendency observed in sterile women and in those with malignant affections of the ovary. Many women, therefore, whose lives should have been imperilled but once, have been compelled to face the dangers of a second operation. In view of these facts, it seems to me wise to remove the sound ovary in all cases of sterility, in every case of malignant degeneration of one ovary, in all cases of colloid cyst—a degeneration which in my experience is very likely to attack the sound ovary—and in all women who have either passed the climacteric or are approaching it, provided the removal is not attended with great additional risk. Double extirpation should also be performed whenever the womb contains a fibroid tumor, or whenever it seems desirable to hasten on the climacteric. In these convictions I am further strengthened by the disappointment often expressed to me by my patients that one ovary had been left behind, and by their great fear afterward lest the

[1] *Journ. of Am. Med. Assoc.*, Oct. 8, 1887, p. 464.
[2] *Medical News*, Sept. 11, 1886, p. 303.
[3] *London Med.-Chir. Trans.*, vol. lxiv. p. 123, Case xxii.
[4] *Tumors of the Ovary*, p. 128.
[5] *Revue de Chirurgie*, Sept. 10, 1887.

remaining organ should also become diseased. On the other hand, in women who are in the prime of their menstrual life the sound ovary should be left untouched, unless there exist grave reasons for its removal.

The Return of Cysts.—Benign cysts once removed never return; but after the removal of a malignant cyst the disease may return at the site of the pedicle and develop into another cyst.[1] This form of return I have seen twice. The disease, however, usually attacks the remaining ovary; or, if both ovaries have been removed, the liver or some other vital organ becomes secondarily infected. Yet there is no question that the removal of malignant cysts is followed by a marked improvement in the health of the woman and in a long reprieve from death.

The Complications of Ovariotomy.

The Intra-ligamentary or Encapsulated Cyst.—One variety of cyst—whether ovarian or not is yet moot—from its site between the folds of the broad ligament, from its papillary and quasi-malignant character, and from the difficulties attending its extirpation, needs special mention. It is called an intra-ligamentary, sessile, or encapsulated cyst, because it is always imbedded, partly or wholly, within the folds of the broad ligament. It contains much papillomatous material, and a few daughter-cysts filled with a clear fluid.

Malassez and De Sinéty are disposed to attribute it to cystic degeneration of supplemental ovarian tissue, lying between the peritoneal folds of the broad ligament. Doran refers it to the hilum of the ovary, and to morbid development of the tubular fœtal relics which there exist, and not to dropsy of the ovisacs in the ovarian stroma. Coblenz, on the other hand, deems it to be a true cyst of the broad ligament, but of that portion which lies between the ovary and the paraovarium, and which contains tubular fœtal relics.[2]

Instead of developing free into the peritoneal cavity, the intra-ligamentary tumor, if it starts from the hilum of the ovary, grows first toward and between the two folds of its own ligament—the tubo-ovarian—then buries itself between those of the broad ligament proper. It parts asunder these two serous folds more and more, the one from the other, and, lifting their skirts, it burrows under the peritoneum, beyond the strict limits of the broad ligament. Thus, it strips off the peritoneal coat of the womb and of the bladder, and, coming into direct contact with those organs—the naked tissue of the one with the naked tissue of the others—it fuses itself to them, and drags them upward. The relationship is now one of continuity, not of contiguity, and, in

[1] *Société de Chirurgie*, séances Dec. 9 and 16, 1885.

[2] I have written more fully on the subject of the intra-ligamentary cyst in a paper published in the *American Journal of Obstetrics*, Jan., 1888.

the efforts made by the operator to free these organs, the womb is often greatly injured and the bladder torn open. The tumor may next strip off the reflected fold of peritoneum of the lower abdominal wall, and solder itself to the denuded muscles. The abdominal incision will then reach the cyst without meeting with a layer of peritoneum.

The upper portion of the sac then bursts through its capsule of broad ligament, and grows free into the abdominal cavity, becoming intra-peritoneal, and with the characteristic nacreous appearance. But the lower portion of the sac remains covered with a pale-red peritoneal investment of broad ligament, between the layers of which it lies buried. There it is subperitoneal, and therefore extra-peritoneal. Should the sac develop downward, it separates the two folds of the broad ligament more and more, and burrows under and lifts up Douglas' pouch. It then may fuse itself to the ureters, to the rectum, and to the great iliac vessels, and all of these organs have been so torn by the operator as to result in speedy death. Twice have I had to dissect several inches of one ureter out of its attachments to the tumor. One of these cases recovered; the other died on the table. It is so difficult to recognize the ureter among the strips and bridles of laterated tissue that, in my opinion, this important tube is often torn across without the knowledge of the surgeon, and that it is, therefore, the cause of death in many cases. If the patient lives long enough, a flow of urine from the incision would then occur; but usually the patient dies before this could happen. Recently I had a successful case, in which a fecal fistula resulted from sloughing of the injured rectum. In another case, a fatal one, the subperitoneal portion of the cyst burrowed so low down between the vagina and the rectum as fairly to cause bulging of the posterior wall of the vagina, even out of the vulva. The operation was a most difficult one, and a fecal fistula was established a few days later.

From Douglas' pouch, after sealing itself to the bony walls of the pelvis, the sac burrows into the folds of the mesentery, or of the meso-colon, or of the mesocæcum, and engrafts itself upon these intestines by continuity of structure. As these viscera will now be forced up in front of the cyst, an unexpected resonance on percussion will embarrass the diagnosis. Further, the capsule itself of broad ligament is very liable, by inflammation, to contract secondary adhesions with contiguous serous surfaces, so that at the same time there may exist structural adhesions by continuity of tissue, and indirect inflammatory adhesions by contiguity of tissue. This double set of adhesions greatly complicates matters, especially as every organ or viscus involved is distorted and displaced, sometimes beyond recognition.

Diagnosis.—The existence of an intra-ligamentary cyst cannot always be made out; but it can be reasonably suspected by the fol-

lowing signs, taken conjointly and not singly: Whenever an enlarged and a laterally displaced womb is so closely adherent to a cyst as to simulate fibro-cystic tumor of the womb; whenever the sound shows that the bladder is elongated vertically; whenever a pelvic descent of the cyst flattens the rectum or effaces the posterior vaginal *cul-de-sac*, and especially by small subsidiary cysts; whenever a cyst embarrasses the acts of defecation and of micturition; whenever the cyst ruptures of its own accord, and not by violence; whenever the growth of the cyst is accompanied by unusual pelvic pains; whenever percussion elicits marked resonance in front of a cyst that is large enough to displace the bowels laterally, and, therefore, to yield a flat sound; lastly, whenever a firmly-fixed cyst is unsymmetrical in shape, and more developed on one side of the pelvis than on the other.

When an intra-ligamentary cyst is exposed to view through the abdominal wound, it presents a very peculiar appearance. The lower portion of the sac in front is covered by a pale-red fibro-muscular capsule, like that of a uterine myoma, for which it may be mistaken. The upper and more distant portion of the front aspect of the sac presents the usual pearly hue of an ovarian cyst. This portion is often free in the peritoneal cavity, and without adhesions, while the encapsulated portion is subperitoneal and immovably fixed. Like an acorn in its cup, the cyst has not a stem or pedicle. Consequently, its blood-vessels enter it—not enclosed in a single slender stalk, as in ordinary ovarian cysts—but in two large sets, widely separated from each other by the intervening portion of the tumor. Thus, the uterine vessels enter it along the oviduct on the middle surface, and the spermatic vessels at the lateral border of the tumor. Sometimes the ligament intervening between these two sets of vessels splits open, and, separating, gives two distinct pedicles to the tumor.

Smaller, thin-walled cysts are often present. They do not spring from inside of the major cyst, but from a common base on the outside, on which they are sessile. According to J. Greig Smith,[1] "the uterus usually lies in a deep sulcus between the major cyst and the minor cysts, giving an appearance of two growths; but sometimes it lies behind the growths, and is overlapped by them."

The Operation.—No cases in surgery demand more coolness, pluck, and judgment on the part of the operator, and none put his resources so much to the test. These are the cases which die on the table, and in which the utmost watchfulness is needed lest fatal collapse should happen shortly after the operation. Formerly, when a cyst was found to be intra-ligamentary, the abdominal wound was hastily closed up and the case abandoned. Now, thanks to Miner[2] of Buffalo, N. Y.,

[1] *Abdominal Surgery*, p. 140.

[2] *Transactions International Medical Congress*, 1876, p. 801.

who first gave us the hint, we enucleate the sac from its capsule, and need rarely to be foiled.

Since the bladder is usually dragged upward, and since it may be adherent to the denuded muscles of the abdominal wall, the incision should be made with the utmost care, the grooved director and vesical sound being put into requisition. Before any attempt at enucleation is made, the major cyst should be emptied by the trocar, and the smaller sessile cysts by the aspirator. When all the fluid has been removed, the opening made by the trocar should be closed by a ligature or by a clamp-forceps. This is done to prevent any of the papillary growths from escaping into the peritoneal cavity and infecting it. No attempt should be made to lessen the size of the tumor by enlarging this opening and by breaking up the papillomatous mass with the hand. This procedure answers well enough in ordinary intra-peritoneal and glandular ovarian cysts. But in an intra-ligamentary papillomatous cyst the hemorrhage would be too free, and the risk too great of infecting the peritoneal cavity by the escape into it of papillomatous material.

Firm traction is now made upon the collapsed cyst, and in some few cases the whole encapsulated tumor can then be removed entire—the dragging forming a sort of pedicle of that portion of the capsule between the sac and the womb, to which it is almost always fastened. But this comparatively free condition of the capsule is rare, and the tumor will usually have to be shelled out of its capsular nest. Many vessels will need tying, and more will demand the pressure-forceps.

Miner's operation consists in slitting open the peritoneal capsule of the sac at points as low down as possible. One finger or more being introduced into these openings successively, the serous and vascular envelope is stripped off in bands, upward to points where the vessels become capillary. These bands, or flaps, of broad ligament are then to be tied, either singly or together, in one or two bundles, and the redundant portion cut off. Sometimes the actual cautery will answer better than the ligature. Several times it has happened in my practice that these flaps did not bleed, and it was not needful either to tie them or to sear them. A drainage-tube will always be needed. This mode of enucleation I have repeatedly and successfully performed, but it is a haphazard one, and it tears the capsule, which is a disadvantage.

An improved technique now aims to keep the capsule whole, and therefore to avoid, as much as possible, tearing or perforating it, as in Miner's plan. After the sac is emptied, it is lifted out of the abdomen by Nélaton's forceps, and the capsule is incised, little by little, in a circle on a line level with the edges of the abdominal incision. The sac is then, *pari passu*, so enucleated as to leave a neat cup-shaped cavity. To do this properly, it is well to begin the enucleation where large vessels enter the tumor, so as to cut off the supply of blood as early as

possible in the operation. First tie and cut the spermatic vessels, which run on the lateral border of the tumor; for the sac has a large vascular capsule, and not a slender stalk, through which it is nourished. Next, with the sound define the position of the womb, which is often masked, as well as dislocated, by the enveloping sac. To this point carry a transverse incision through the capsule, from the spermatic vessels. Here will be found the large branches of the uterine artery. These, when severed, must be secured by ligature or by pressure-forceps. Through this transverse incision an attempt is made with the fingers and the scissors to shell out the tumor, care being taken not to tear or to perforate the capsule; but such injuries to it are often unavoidable.

As the surgeon proceeds, he will have to tie or clamp many blood-vessels. At times he will be wholly at sea, not knowing where he is; but by establishing the site of the womb and of the bladder by the sound, he will get trustworthy landmarks and safe points of departure. To prevent soiling of his hands, the sound should never be passed by the operator, but by an assistant. When no further advance can be gained in front, the incision is extended around the whole capsule, and the enucleation is carried on from the sides and from behind in such a way that the uterine attachment is left until the last.[1] The fact is, that one has to work from front to back, from side to side, gaining here and there a little, applying ligatures and catch-forceps at every advance, until the sac is wholly shelled out of its capsule, or until a sort of pedunculated attachment to the womb is formed, which can be ligated *en masse*. This ligature will sometimes have to include uterine tissue. It will be still more likely to include a portion of the cyst itself. In this case the secreting layer of the improvised pedicle should be either peeled off or charred by the thermo-cautery. In like manner, whenever attachments to important viscera cannot be safely severed, the adherent portion of the sac must be cut out and left behind, the secreting layer being afterward removed or destroyed. In some cases it will be safer to extirpate the womb itself, together with the adherent sac, than to attempt to free it.

The base of the cyst, as has been stated, often burrows deep into the pelvis, and, being in close relation with the rectum, the ureters, and the iliac vessels, needs most careful enucleation. Usually, several large blood-vessels here will need to be tied. Sometimes they lie so deeply as not to be reached by the ligature, and they will then have to be caught by long pressure-forceps, whose handles must be brought out at the lower angle of the abdominal incision, and tied together. They will then act the part of a drainage-tube. Oozing must be treated by sponge-pressure, by the thermo-cautery, or by Monsel's solution of iron. Internal hemorrhage may also occur. In one of my successful cases I

[1] Hegar and Kaltenbach: *op. cit.*, p. 233.

had to reopen the wound four hours after the operation, in order to secure one of these deeply-situated vessels. The drainage-tube told the tale of hemorrhage.

The management of the vast cavity in the empty capsule must next be considered. Since there will always continue some oozing of blood, which cannot be wholly stopped, and since much bloody serum will pour out from the flayed surfaces for several days to come, it is well, when possible, to secure the exclusion of this cavity from that of the peritoneum. This may sometimes be accomplished by one of two ways.

By one way as much of the capsule as possible is cut away, and the free edge of the remnant is attached to the borders of the abdominal incision, either by special sutures or by the sutures which close up this wound. Any tear in the capsule should be sewn up on its peritoneal surface by catgut sutures. This is done, both to cut off the remnant of the capsule wholly from the peritoneal cavity, and to get rid of a hole into which the omentum or a bowel-loop might enter and become strangulated. A large drainage-tube is finally passed into the capsule, the peritoneal cavity is cleansed by irrigation, and the abdominal wound is closed. If numerous adhesions have also been severed in the peritoneal cavity proper from which oozing keeps up, another drainage-tube must be inserted into it.

The other way of excluding the cavity of the capsule from that of the peritoneum has warm advocates among the best German operators, but it is more difficult to perform. From the floor of the intra-ligamentary capsule a long-handled catch-forceps is thrust downward through the roof of the vagina, which is rendered tense by the introduction of two fingers from below. By this forceps a rubber drainage-tube with wings is seized and drawn up into the cavity. The vaginal end is wrapped up in salicylated cotton or in iodoform gauze, and the vagina loosely packed with the same material. The edges of the capsule are now trimmed, and sewn, the one to the other, by catgut sutures, and its cavity thus securely isolated from that of the peritoneum. The difficulties here lie in the depth at which one has to work, and in the patching up of a badly-torn and ragged capsule.

Whenever neither of these modes of exclusion can be adopted, because either the capsular lid is not large enough to cover its cavity, or the capsule has been too badly torn to be sewn up, a large drainage-tube, or even two of them, should be introduced into the pelvic cavity.

On the other hand, should it be impossible to remove the lower portion of the intra-ligamentary cyst from its capsule, the secreting coat should be stripped off, or thoroughly scraped, so as to remove the papillary growths. But, usually, when a portion of an intra-ligamentary cyst has been left behind, a rapid proliferation of papillomata will go on, ending after a few months in death.

Incomplete Operations.

Sometimes an ordinary intra-peritoneal cyst is so fused to the pelvic fascia or to the surrounding viscera, such as the liver, gall-bladder, diaphragm, stomach, spleen, womb, and bladder, that it would be hopeless to attempt its removal. Under such unfortunate circumstances the cyst is emptied, and an incision is made in it large enough to admit the hand. All the daughter-cysts are then crushed, and the cavity thoroughly cleansed. As much as possible of the cyst is cut away, and the remnant is stitched to the abdominal incision, which is kept open by a large cloth tent at its lower angle, or by two glass drainage-tubes, one at each angle of the wound.

Since the opening into the sac is often larger than the abdominal incision, the edges of the former are usually stitched to the latter in several isolated folds or plaits. Schroeder, however, adopted a plan which seems to me not only more neat, but also more effective, in cutting off the discharges of the sac from the abdominal cavity. The edges of the sac and of the wound are stitched evenly together on each side, from the lower angle upward to the upper angle. At this point the redundant portion of the sac—or fulness, as seamstresses call it—is taken up, or folded, in one large plait, and its edges alone are sewed together. This mode of sewing together the edges of the two wounds makes a smooth and even fit, which several isolated plaits or folds cannot attain.

Should many adhesions have been severed before it is found impossible to remove the whole cyst, all bleeding should be checked, and a careful cleansing of the peritoneal cavity made before the abdominal incision is closed. If needed, a third drainage-tube can be placed in the peritoneal cavity. This tube should then occupy the lower angle of the wound, so that it may drain the pelvic basin.

Sometimes it may be best to tie the adherent portion in sections and to cut the free portion away. A drainage-tube must then be inserted in the lower angle of the wound. This expedient has the sanction of Atlee and Olshausen, who have reported successful cases thus treated.[1]

It is very seldom, indeed, that I do not complete an ovariotomy; but in one malignant case I adopted the following plan, which answered very well: After the daughter-cysts had been crushed and the sac cleansed, as much as possible of it was cut away. The remnant was gathered together and brought out at the lower angle of the wound. Into this was inserted a short nickel-plated steel drainage-tube of large bore, and the sac was firmly clamped to it by a small wire écraseur (Koeberlé's). Into this metal tube was passed a glass drainage-tube long enough to reach the deepest portion of the sac.

[1] *Monthly Abstract*, July, 1877, p. 334.

In such cases, when feasible, I think it would also be well to adopt Freund's plan of tying the stalk of the sac and severing it, in order to lessen the blood-supply.[1]

The drainage-tubes must be kept in until all discharge ceases. This may take from a few weeks to several months. After the first week—by which time the mouth of the sac will have become firmly united to the abdominal wall, and the sac will be securely cut off from the peritoneal cavity—antiseptic solutions may be thrown in. The best are 5 per cent. solutions of carbolic acid, claret-and-water colored solutions of potassium permanganate, and a 1 : 2000 solution of corrosive sublimate. When the discharges are offensive the injections should be made at least twice a day, and then with the two former solutions in preference to the latter. After an incomplete operation, treated by the foregoing manner, many cases recover; but a large number cannot stand the long-continued drain on their system, and die from exhaustion.

Vaginal Ovariotomy.

Sometimes, when a small cyst grows downward—beneath the broad ligament, instead of above it—and bulges into the vagina, or when a cyst of small size, especially if purulent or if dermoid, is lodged in Douglas' pouch, it may be tempting to remove it by a vaginal incision. A number of successful cases of the kind have been reported,[2] among them one of my own. No fatal cases have, indeed, yet been recorded. But the working-room is so narrow, and the impossibility of seeing what one is doing is so objectionable, that it is never likely to become a favorite mode of operation. Yet I can conceive of cases in which the removal of the cyst per vaginam might be the wisest course to pursue.

[1] *Boston Med. and Surg. Journ.*, Aug. 24, 1876, p. 219.

[2] *Lessons in Gynecology*, 3d ed., p. 495; also *Journ. of Am. Med. Assoc.*, Oct., 1887, p. 464.

DISEASES OF THE OVARIES.

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I. BATTEY'S OPERATION.

By ROBERT BATTEY, M. D.

Definition.—By the term "Battey's operation" is meant the removal of the ovaries from the human female whilst those organs are yet in a state of functional activity, with a definite object in view—viz. the arrest of the function of ovulation and the production of the change of life for the effectual remedy of otherwise incurable diseases or the pernicious consequences of malformation. There are obvious objections to coupling the name of any individual with a disease, a remedy, or a surgical operation. Men die and pass away from our sight and our thoughts, but Science is immortal. Nevertheless, in the imperfection of our knowledge and our methods it has sometimes been found difficult to affix satisfactory scientific terms, and in many instances it is convenient to use the name of an individual describer, discoverer, or inventor to convey our precise meaning. Such a case, it is believed, presents itself in this operation. Battey's operation is not the removal of an ovary simply, whether the ovary itself be diseased or healthy, and yet it may involve in the accomplishment of its true object—*i. e.* the change of life—the removal of ovaries either normal or abnormal in their anatomical structure. It is not, therefore, an oöphorectomy, nor is it simply the removal of appendages from the uterus; but it is a surgical procedure by which we aim to bring about a great physiological change in the system of the patient for the remedy of disease. The natural change of life which occurs at the climacteric is in no sense a "spaying" or "castration of women," and it is quite as inappropriate to attempt to apply either of these terms to the artificial change of life which attends upon Battey's operation.

History.—There has been handed down to us from a remote period as an historical fact the statement that certain kings of Lydia caused the ovaries of women to be removed, producing female eunuchs which were afterward used in their service. We are also told that a Hungarian sow-gelder nearly two centuries ago, being disgusted by the lewd

practices of his own daughter, proceeded to spay her as he was accustomed to do with the lower animals. It is impossible to say at this distant period whether or not these were cases of extirpation of the human ovary, but there are good reasons to believe they were simply cases of mutilation or excision of the external organs or pudenda.

There exists in portions of Russia and in Roumania a religious sect termed the Scoptz the members of which are said to practise as a religious rite the castration of women as well as of men. An investigation upon this subject made in the year 1873 by the U. S. consul at Bucharest[1] shows that the so-called castration of women among the Scoptz does not consist in the removal of the ovaries at all, but the mutilation or excision of the female breasts, together with the clitoris, the labia minora, and sometimes the labia majora.

Mr. Percival Pott in the last century removed both ovaries from a young woman in operating for hernia. He thus relates the case:[2]

"A healthy woman, about twenty-three, was taken into St. Bartholomew's Hospital on account of two small swellings, one in each groin, which for some months had been so painful that she could not do her work as a servant. The tumors were perfectly free from inflammation, were soft, unequal in their surface, very movable, and lay just on the outside of the tendinous opening in each of the oblique muscles, through which they seemed to have passed.

"The woman was in full health, large-breasted, stout, and menstruated regularly; had no obstruction to the discharge *per anum*, nor any complaint but what arose from the uneasiness these tumors gave her when she stooped or moved so as to press them.

"She was the patient of Mr. Nourse. He let her blood and purged her, and took all possible pains to return the parts through the openings through which they had clearly passed out. He found all his attempts fruitless, as did Mr. Sainthill and myself; and the woman being incapacitated from getting her bread, and desirous to submit to anything for relief, it was agreed to remove them.

"The skin and membrana adiposa being divided, a fine membranous bag came into view, in which was a body so exactly resembling a human ovarium that it was impossible to take it for anything else: a ligature was made on it close to the tendon, and it was cut off. The same operation was done on the other side, and the appearance, both at the time of operating and in the examination of the parts removed, was exactly the same. She has enjoyed good health ever since, but is become thinner and more apparently muscular; her breasts, which were large, are gone, nor has she ever menstruated since the operation, which is now some years."

[1] *Atlanta Medical and Surgical Journal*, vol. xi. p. 483.

[2] *Chirurgical Works of Percival Pott, F. R. S.*, London, 1783, vol. iii. p. 329.

In January, 1879, Dr. J. H. Aveling called attention in the *Obstetrical Journal of Great Britain and Ireland*[1] to the "substance of a paper read before the Medico-Chirurgical Society of London in 1823. This paper was entitled 'A Contribution of Experiments and Observations on Injuries of the Belly, considered in their relation to Abdominal Surgery, by James Blundell, M. D., Lecturer on Physiology and Midwifery at Guy's Hospital; communicated by J. H. Green, Esq.'" The author deduces the following conclusions:

"1st. That the generally received opinion, that inflammation in a spot of the peritoneum will almost invariably diffuse itself over the greater part of that membrane, is unfounded on truth.

"2d. That extensive divisions of the peritoneum are not of necessity fatal—that the womb, spleen, and ovaries may be taken away without necessarily destroying life."

Reasoning from these facts and observations, the author proceeds to suggest the consideration of some operations which hitherto had not been considered justifiable by British surgeons, such as a division of both Fallopian tubes, the extirpation of the healthy ovary, the extirpation of the ovarian cyst or dropsy or a portion of it, the removal of the cancerous womb, the puerperal uterus, and of part of the bladder and spleen. Blundell goes on to remark of the extirpation of the healthy ovaries: "This operation, even granting it to be safe, can scarcely in any instance be necessary, though it may be observed, by the way, that it would probably be found an effectual remedy in the worst cases of dysmenorrhœa and in bleeding from monthly determination on the inverted womb, where the extirpation of the organ was rejected."

In 1878, Prof. Hegar, then of Freiburg, published to the world, for the first time, in his work upon *The Castration of Women*,[2] an account of his fatal operation done on the 27th of July, 1872. With the body of his patient seems to have been buried the new operation, for, although he quotes freely in his work from the publications made by Battey in September, 1872, in May, 1873, in October, 1875, he does not appear to have gained courage to repeat this operation until his second case, done on the 2d of August, 1876, at which time this operation, by the energy and persistent efforts of Battey, had become widely known throughout the civilized world. The operation had been repeated many times and by a number of operators, and had already become a recognized procedure in America. But for the successful labors of Battey it does not appear that Prof. Hegar would ever have ventured upon a second attempt. After more than four years' disuse Hegar reports, in the work cited, no less than seven operations in the short space of eighteen months, clearly showing the effects of the work done in America upon Hegar's estimate of the value of the new operation.

[1] Vol. vi. p. 617.

[2] *Die Castration der Frauen*, Leipzig, 1878.

Of the claim of Mr. Lawson Tait to the origination of this operation it is difficult to speak with certainty, owing to the ambiguity of his style of writing, at one time reporting his case as a fatal one,[1] and afterward making the astonishing discovery that his patient had recovered and regained her health;[2] at one time giving to Battey the credit of priority in the publication of his original case,[3] and at another time, with equal positiveness, claiming this priority of publication for himself.[4] The history of the time shows a few unmistakable facts, viz.: 1. Mr. Tait made no publication of his case prior to May, 1879, and then made but a bare mention of his three fatal cases, without any detailed history or statement of particulars. 2. It is equally evident that Mr. Tait could not have foreseen any of the great results which were to grow out of this operation, or he would not have remained for nine years ignorant of the fate of his first patient, whether she lived or died. 3. Mr. Tait, having published in 1873 his Hastings' prize essay upon *The Diseases of the Ovaries*, certainly could not have foreseen any of these results, or he would have taken that occasion to put himself upon record before the medical world.

In strong contrast to the reticence and modesty of Mr. Tait in bringing his work in this department before the profession, stands out in bold relief the zeal and persistency manifested by Battey, availing himself of every opportunity to spread the histories of his cases before the profession everywhere, and stoutly and vigorously defending the operation against attack from every quarter. It should not be forgotten, too, that this was at a period fitly characterized by Mr. Tait himself as "perilous times"[5] with surgeons engaged in this work. It cost something then to work and to talk in support of the operation, but it needs little of either labor or personal bravery to pluck the fruit when it is ripened.

With Battey the discovery of this operation was the result of mature and deliberate thought. As early as 1866 he was charged with the care of a young lady aged twenty, apparently perfect in her physical organization, save only in the absence of her menses. The menstrual molimen had recurred at the usual intervals without any show of menstrual blood. The nervous and vascular disturbances which attended upon this failing function had broken down and destroyed her health, and she died without relief. To Battey the untoward result of this interesting case was most unsatisfactory. His investigations showed an absence of uterus, there being but a small rudimentary nodule to represent that organ. He reasoned with himself that the fatal issue of this case was due to the functional activity of the ovaries uncompen-

[1] *British Medical Journal*, May 31, 1879, p. 813.

[2] Mr. Lawson Tait: "Table of Cases at International Medical Congress," August, 1881.

[3] Tait's *Diseases of the Ovaries*, 1883, p. 326.

[4] *Ibid.*, p. 107.

[5] *Medical News*, July 3, 1886, p. 26.

sated by the normal issue of blood. He said to himself, "If I could but remove her ovaries, stopping the function of ovulation, the balance would be restored; there would no longer be need of the function of menstruation." He diligently and anxiously searched the records of medicine for light upon this subject, but he searched in vain for any effective remedy to control the diseased condition, or for any precedent for the extirpation of the ovaries in such circumstances. Feeling within himself great dissatisfaction with the paucity of our resources under such circumstances, he inwardly determined that another such case should not die on his hands without essaying the extirpation of the ovaries in the hope of rescue.

It was not long after the fatal issue in this case that there came under his observation a young lady with persistent and long-standing amenorrhœa, whose general health was racked and broken down by a similar condition of unrelieved menstrual molimen. After long and fruitless efforts to establish the menses and to relieve the sufferings of his patient, he was forced to offer her the extirpation of her ovaries as the only remaining hope of her restoration to health. The proposition was made to the patient and her friends as the naked creation of his own brain, and it was distinctly stated to them that it was unsupported by any practical test and wholly unsupported by the authority of any recognized medical opinion. The patient was warned that she might encounter as a result of this operation the loss of many of the feminine graces; that a masculine change in her voice was possible; that the sprouting of beard upon her face was possible; that she might confidently expect to be completely unsexed by the operation. So extreme were her physical suffering and her utter despair of other relief both she and her family seized with avidity the proffered alternative in the operation.

On the 17th of August, 1872, at Rome, Ga., the operation was done whilst she was already experiencing the prodrome of a coming paroxysm. The patient having been chloroformed, the abdomen was opened three inches in the median line. The pelvis was now explored with two fingers of the left hand. The uterus in respect to its size, position, and texture appeared to be perfectly healthy. The ovaries likewise appeared healthy. There were no abnormal adhesions of the pelvic organs. To the right of, and behind, Douglas' fossa was a fibrinous deposit, probably the remains of abscesses in that region which had discharged by the rectum and vagina. The right ovary was quickly brought to the light between two fingers and examined. Upon its upper and posterior surface was distinctly marked a freshly-ruptured Graafian vesicle, with a small drop of yet liquid blood exuding from the point of rupture. It seemed as though the ovum had but just escaped. The base of attachment to the broad ligament was transfixed at the centre with a needle carrying double silk, and tied in two equal

halves. The left ovary was now searched for and seized over the ramus of the pubis at the left inguinal ring. Upon its surface it presented likewise the marks of a recently-ruptured Graafian vesicle, with a spot of darker-colored and coagulated blood in the point of rupture. It appeared probable that two, possibly three, days had elapsed since the escape of this ovum, but certainly not five weeks, to correspond with her last paroxysm. The pedicle of the left ovary was ligatured in like manner as the other. The ovaries having been previously cut away, the ligatures were cut short and the pedicles allowed to drop back into the pelvis. There was a little oozing of blood-stained serum, which was carefully sponged out, and the walls of the abdomen were brought together by three deep silver-wire sutures, including the peritoneum, and secured by compressed shot. Eight superficial sutures completed the closure. No attempt was made at any special antiseptic precautions in the operation. The patient was put to bed in one hour from the commencement of the chloroforming. On the second day the weather became intensely hot, and so continued up to the fourteenth day, without a drop of rain to cool the burning earth, the thermometer ranging from 90° to 98° Fahr. in the shade. She had some septic complications, but was out of bed on the sixteenth day, and made a good recovery.

In the following month a detailed history of the operation was published by Battey in the *Atlanta Medical and Surgical Journal* for September, 1872, with the statement, "As far as my means of information enable me to judge, this operation is unique in the annals of surgery, the nearest approximation to it being the celebrated case of Percival Pott, which is so distinctly stated in his *Chirurgical Works* that I may well close my report by its recital."

Theory of the Operation.

From an early period in the history of medicine physicians have encountered a variety of diseased conditions connected more or less directly with the functions of ovulation and menstruation in women, which have proved rebellious to all remedies; and it had grown to a custom to encourage such invalids to bear as best they might their sufferings, alleviated by such means as the existing state of the art afforded, looking forward hopefully to the climacteric period, when the natural change of life might be expected to remove the cause of their sufferings and restore them again to health. Not unfrequently these expectations were realized. In many cases death relieved them of suffering before the climacteric could come to the rescue. In very many serious structural lesions would intervene and render Nature's cure impossible. Battey reasoned with himself, If the change of life is to be relied upon

as the only hopeful remedy, why not have it now by the hand of art, instead of waiting long years for its natural occurrence? He foresaw that there must be a variety of diseased conditions which could be, and ought to be, remedied by the establishment of the artificial menopause. He reasoned, further, that the extirpation of the ovaries by arresting the function of ovulation would likewise arrest the function of menstruation and produce an artificial change of life, with all the nervous and nutritive changes which attend upon the natural change of life. The prime object, therefore, which he had in view was the production of the artificial change of life, and not simply the removal from the body of a diseased organ. Experience, however, in the use of the operation very soon showed that the ovaries removed were not healthy, but diseased in their anatomical structure.

INDICATIONS.—From the very inception of the operation Battey foresaw that the field for its usefulness must be a somewhat varied one, as the variety of cases in which physicians were accustomed, in the paucity of their resources, to invoke the natural change of life as the only hopeful remedy covered quite a number of diseased conditions. He therefore formulated the proposition that this operation is indicated in any grave case of disease which is either dangerous to life or destructive of health and happiness—which is incurable by the recognized resources of our art, but which we may reasonably hope to cure by the change of life. It was his custom, in the selection of suitable cases for operation, to ask himself three questions: 1st. Is this a grave case? If the answer be Yes, then, 2d, Is it incurable by the recognized resources of our art? If the answer be Yes, then, 3d, May we reasonably expect to cure it by establishing the change of life? If the answer still be Yes, then the case is a suitable and proper one for the operation. After the lapse of years and with his riper experience he is still accustomed to select his cases by the same unerring formulary. If he be asked, "Is the operation indicated for dysmenorrhœa? for uterine and ovarian displacements? for menorrhagia? for uterine myoma? for nymphomania? for oöphoro-mania? for oöphoro-epilepsy? for malformations of the uterus and vagina?" he answers both Yes and No. The operation may be indicated in certain cases under each and all of these headings, and contraindicated in other cases of the same.

METHODS.

The ovaries may be removed either by the abdominal incision or by opening the posterior vaginal cul-de-sac into Douglas' space.

VAGINAL METHOD.—The patient is placed in the semi-prone posture of Sims, and the perineum retracted by Battey's modification of the Sims speculum, consisting of a short, slightly-cupped blade mounted

upon a secure handle and bent to an angle of 45° with the handle, in such manner as to press the posterior vaginal wall well back into the hollow of the sacrum, and give ample room for the incision between the point of the blade and the uterine cervix. The cervix uteri is now seized with a stout vulsellum and dragged well down under the arch of the pubis. With a small tenaculum and scissors the posterior vaginal cul-de-sac is opened the distance of one inch in the median line, and the incision extended into Douglas' space. The index finger is now passed up the posterior wall of the uterus, and swept across upon either broad ligament to examine the condition of the ovaries, to rupture adhesions, and to guide the introduction of a placenta-forceps, with which the ovary is seized and brought down into the vagina. The organ may be removed by throwing around it the chain of an écraseur and very slowly crushing the pedicle of attachment, or the pedicle may be transfixed and tied in two parts with carbolized silk, when the ovary is cut away with scissors; and the opposite ovary is brought down and dealt with in the same manner. Experience has shown in a number of cases that the écraseur may be safely trusted where the vaginal opening remains for drainage. If any undue oozing of blood occurs, a small lump of ice slipped through the incision into the cul-de-sac quickly stops it, or it may easily be controlled by irrigating Douglas' space with hot water. It is important that the crushing of the pedicle should be done very slowly, to avoid hemorrhage.

Fig. 290.

Battey's Modification of Sims' Speculum.

Experience has shown that it is unnecessary to suture the incision made in the vaginal operation, as it speedily contracts down to a small opening, and in no instance has there been protrusion of bowel through it. When the speculum is withdrawn, the uterine cervix forms a sufficient obturator for the opening. It was formerly supposed that the vaginal method of operating offered special advantages, in that the tissues incised were thin, in that the pelvic peritoneum was supposed to be less prone to grave peritonitis, in that atmospheric air was not admitted to the general cavity of the abdomen, and especially in that the dependent position of the opening was highly favorable to drainage of liquids from the cavity. It is now doubtful whether any of these supposed advantages really exist in point of fact. The objections to the vaginal method are—1st. We are liable to encounter extensive and firm adhesions, and also hydrosalpinx and pyosalpinx, which in many instances cannot be satisfactorily dealt with through the vaginal opening. 2d. During the operation uterine and vaginal secretions are carried into Douglas' cul-de-sac by the finger of the operator. The open-

ing made is situated behind the os uteri, and when the patient is placed upon her back in bed the inclination of the vaginal canal backward and downward tends to gravitate these secretions into the wound. 3d. It is not practicable in this method of operating to carry out successfully the antiseptic precautions.

Abdominal Method.—The patient is placed upon a narrow cushioned table before a window, her feet resting in a chair. Having been anæsthetized, the incision is made, in the median line, of such length as to permit, when all bleeding has been stayed, the opening of the peritoneum one inch and a quarter, which may afterward be extended if found necessary. The index finger is now passed in behind the body of the uterus and swept to the right and left to ascertain the precise position and condition of the ovaries and tubes. If these are found to be adherent, the lymph-deposits are carefully broken up by the finger and the ovaries freed, when they are successively brought into view, the finger being placed upon one side of the ovary and the fenestre of Sims' depressor on the other; or, guided by the finger, the ovary is seized and brought out with a suitable forceps.

Fig. 291.

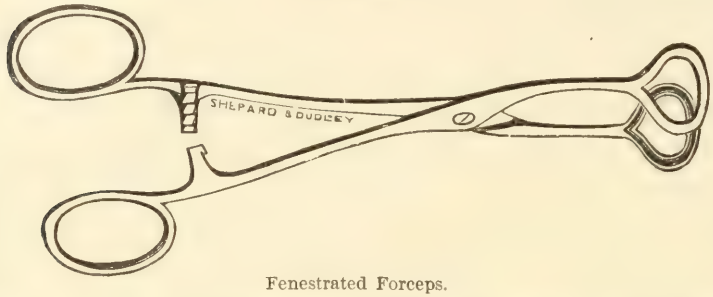
Sims' Depressor.

If there be pyosalpinx or hydrosalpinx or the tube be firmly adherent to the ovary, it should be removed with it. The pedicle is transfixed with a ligature of carbolized silk and tied upon either side. The ends of one of the ligatures are passed around the entire pedicle and tied for additional security. The ligature should be placed well down upon the broad ligament in order to leave sufficient tissue in the distal portion to prevent slipping of the ligature.

Great care should be used, in cutting away the ovary, to remove every particle of its stroma. A small sponge mounted upon a holder is now passed gently down into the bottom of the cul-de-sac to ascertain if there be blood lodged there, which should be carefully washed out. If a cystic ovary shall have burst in the manipulation, discharging any portion of its contents into the abdominal cavity, or if there should be persistent oozing from ruptured adhesions not readily and perfectly controllable, it is better to lodge an aseptic drainage-tube of rubber in Douglas' space, to be secured in the lower angle of the wound. The abdominal walls are brought together with deep sutures of carbolized silk, two or three to the inch, and intervening superficial sutures uniting simply the edges of the skin. In lodging the deep sutures the needle is entered the third of an inch from the incision, and transfixes the skin, cellular tissue,

the edge of the conjoined tendon, and the peritoneum, and the similar structures upon the opposite side, in such manner that when the sutures are tied the severed edges of these several structures will be brought

Fig. 292.



Fenestrated Forceps.

closely in contact. The wound is dressed with carbolic cerate along the line of incision, covered by a good pad of absorbent cotton held in place by a flannel bandage, with perineal straps to prevent the bandage from slipping upward.

After-treatment.—In Battey's operation, if the surgical procedure has been strictly aseptic, as it should be, the after-treatment consists more in the judicious refraining from officious intermeddling than in any active interference. The use of opium, aside from securing rest from severe pain, is not curative in these cases, and the administration of quinine, veratrum, or calomel is rarely beneficial and usually only injurious. Simple purgatives, by opening the alimentary canal and removing any remaining feces, and by setting up a process of excretion of morbid materials from the blood, are especially useful. The surgeon cannot too thoroughly understand that when the operation is finished and his patient put to bed the issue of the case for life or for death is, for the most part, already determined. Woe be to him who neglects the proper cleansing of the abdominal cavity in the hope of supplying the deficiency by subsequent eliminative medication!

The patient is put to bed upon the back, the knees drawn up, supported by a cushion, and the position occasionally changed to either side. The use of opium is to be avoided, except as may be actually necessary to allay severe pain. When used, the elixir by enema is to be preferred. The stomach is kept empty for twelve to twenty-four hours, when small draughts of hot water may be allowed, to be followed subsequently by lime-water and milk. The use of ice is rarely beneficial. It but serves, in the reaction which follows, to produce a burning thirst, which continuously calls for more, until the overloaded stomach rejects the accumulated liquid. Not unfrequently, the urine is voided normally. When the catheter is used it is well to avoid its frequent introduction; an interval of eight to twelve hours may ordi-

narily be allowed. In the evening of the third day a gentle but efficient purgative should be given, bearing in mind the fact that Nature splints the bowels after these operations, and larger than ordinary doses of purgatives are required. One or two grains of aloin in gelatin-coated granules, or full doses of Crab Orchard salts in combination with Seidlitz, are usually well borne and prove to be efficient. When the nausea and vomiting are urgent and purgatives cannot be borne upon the stomach, enemata of castor-oil emulsion or of infusion of senna may be substituted.

The bowels having been well moved and flatus expelled, the deep sutures should be withdrawn upon the fifth day, leaving to the tenth or twelfth day the superficial sutures uniting the edges of skin. In general, on the fifteenth day the patient is allowed to sit up, and upon the twenty-second day may be discharged if her home be near at hand, otherwise retained to the end of the fourth week. The abdominal bandage should be continued for three or four months after her discharge. Care in the selection of the diet should be observed for a period of at least two months following the operation.

Results.

Upon the third or fourth day after the operation there appears, with great uniformity, a discharge of blood and mucus from the uterus of the same characters presented in the normal menses. This discharge occurs equally, though the normal period of menstruation may be due within a few days or not until three weeks have elapsed. It is evidently the result of the operation, and not a recurrence of the natural menses. It is, then, a metrostaxis, and not menstruation. Ordinarily there is no subsequent recurrence of this phenomenon, but in exceptional cases it may show itself after the lapse of four weeks, and may continue its monthly recurrence for a number of months or even years. In some cases there is a cessation of this discharge for several months, when it may recur once or twice or even many times. Whether this pseudo-menstruation be dependent upon the presence of a supernumerary ovary or is merely due to the periodical congestion of the uterine mucosa, kept up by long-established habit, is not yet definitely determined. Where portions of ovarian stroma have been left behind in the pedicle, the ovaries having been incompletely removed, it has been predicted that menstruation would be regularly continued; and the prediction in every such instance has been verified. In one notable case not only has the leaving of a small portion of ovarian stroma kept up for years the regular recurrence of the menses, but the health of the patient has been completely restored, and a healthy child was born two years after the operation.[1]

[1] *Transactions International Medical Congress*, London, 1881, vol. iv. p. 288.

It is interesting to observe in a case of chronic oöphoritis attended by great ovarian pain and the formation of the morphine habit, an exploratory incision was made, and adhesions of a formidable character encountered upon both sides, which seemed to preclude the idea of extirpating the organs. The abdomen was therefore closed without disturbing the parts more than simply to diagnosticate the case. The patient got up quickly from the exploration, and, believing that her ovaries had been removed, her pain disappeared, and with it the menses. She promptly gave up the use of morphine and enjoyed excellent health for the space of six months following upon the operation, when the menses returned, and her old pain as well, and she again resumed the use of morphia. Subsequently a determined effort was made for her relief: the firm adhesions were broken up and the ovaries and tubes thoroughly removed and a complete cure effected.

It has been claimed that the removal of the tubes along with the ovaries ensures the complete menopause, but experience has conclusively shown that the claim is unfounded.

In this connection it may be observed that the ratio of cases of this pseudo-menstruation noted in the experience of Battey[1] after the removal of both ovaries does not greatly exceed the relative proportion of cases of supernumerary ovaries found in women examined by Beigel.

Of the risk to life which attends upon this operation it is difficult to speak with precision. In the hands of different operators, even men of acknowledged experience and skill, the death-rate has varied very widely. It may be fairly stated, however, that in skilled hands, with favorable surroundings, the mortality would not ordinarily exceed two or three in the hundred.

The object of this operation being to cure disease through the physiological revolution which takes place in the female organism at the change of life, it is not to be expected that the remedial effects of the operation will be secured at once. In some exceptional cases, however, this does occur, and the patient passes promptly from a condition of great suffering into one of comfort and happiness. In general, however, the change is a gradual one, passing through many months, and two, three, or even five, years may elapse before the beneficial results of the operation are fully realized In some instances, so great is the breaking-down of the nervous system by long years of suffering, the case becomes absolutely incurable by this or any other known means. To render the cure effective, therefore, whilst we are, upon the one hand, to be well assured of the necessity of the operation before essaying it, we should not be unmindful of the fact that long years of delay may render it ineffectual.

It was formerly supposed that extirpation of the ovaries in the

[1] *Transactions of the American Gynecological Society*, 1887.

human female would be followed by the loss of many of the feminine graces and the taking on of certain characteristics of the male, such, for instance, as a masculine voice, the sprouting of beard upon the face, atrophy of the mammary glands, loss of the graceful rotundity of the female figure, etc. Such a supposition is not founded in correct physiological reasoning, for, whatever changes might be supposed to result from the operation, they must be of a negative character, and could not eventuate in implanting upon the female organism the positive characteristics of a man. It was supposed also that such mutilation would not only deprive woman of her childbearing power, but would also completely unsex her and unfit her for the duties of a wife. Experience has now abundantly shown that all these suppositions are founded in error, for the loss of the ovaries does not in itself produce any of these supposed results, but the subjects of it, when recovered in health, become in many instances splendid specimens of perfect womanhood, save only in the loss of the normal menses and the power of procreation.

Of 54 cases in his private practice carefully followed up from one to ten years by Battey, there were cured 33; much improved, 8; little improved, 5; not improved, 8. There was complete menopause in 50, and pseudo-menstruation in 4. In 2 of the latter the tubes were also removed, and in 2 they were not.

II. DISEASES OF THE OVARIES.

By HENRY C. COE, A. M., M. D.

While a careful examination of a Fallopian tube can hardly fail to reveal the presence of an existing deviation from the normal, however slight, in the case of the ovary the pathologist is frequently at a loss as to how he may interpret the changes which he finds. The tube is quite simple anatomically. It is merely an offshoot from the uterus; but the ovary is an exceedingly complex organ, about which much remains to be learned. If any one doubts this fact he has only to refer to the literature of the subject, when he will find that two equally competent observers not only describe different histological appearances in ovaries that are to all intents similar, but that even if the same objects are discovered within the stroma their presence is explained differently. While it is true that an ideally normal ovary is not often encountered, at least in a subject who has reached puberty, it is equally true that we may be mistaken in assuming that certain microscopical changes in the gland are of a morbid character.

Several factors conspire to render the ovary peculiarly susceptible to inflammation, either primarily or more often in connection with affections of the other pelvic organs. A reference to the description of its internal anatomy will make it sufficiently clear that the vascular and nervous supply is so rich and intricate that a frequent disturbance of its delicate adjustment seems almost inevitable. The periodical enlargement of the normal gland not only appears to favor the development of morbid conditions, but aggravates disease after it has once become established.

Physiological rest is as impossible for the ovary as it is for the spleen, and for similar reasons. It is constantly enlarging and diminishing as the result of variations in the blood-supply. Not only is the entire organ liable to engorgement, but the existence of localized foci of disease is possible, the Graafian vesicle being liable to be affected when no marked changes can be found in the surrounding stroma.

Besides what may be termed the intrinsic causes of inflammatory conditions in the organ, its environment is such that it readily shares in disturbances in adjacent viscera. It is unnecessary to refer to the intimate relation which exists between the plexuses of nerves and vessels of the broad ligaments, and to call attention to the fact that any obstruction to the circulation means congestion of the uterine appendages; it is equally superfluous to remind the reader that the obscure reflex neuroses which frequently accompany ovarian disease are explicable by reference to the communication of the pelvic plexuses with

those of the general sympathetic system, while neural influences may preside over organic changes in the gland in some manner as yet unknown.

The anatomical relations of the ovary render it peculiarly vulnerable; surrounded as it is by peritoneum, lying in the folds of the broad ligament—a region constantly the seat of localized inflammation—it may either share in inflammatory processes or may be surrounded by adhesions. The intimate relation of the tube to the ovary, and the continuity of the lining membrane of the former with that of the lower genital tract, constitute, according to recent authorities, one of the most common causes of oöphoritis. That salpingitis can exist without disease of the corresponding ovary is not certain; that they are frequently associated is a fact of daily observation. That diseases and displacements of the uterus may be the direct cause of ovarian affections is almost self-evident.

It is rarely possible to trace the chain of causes in morbid conditions of the ovary. Given a cirrhotic or cystic organ buried in a mass of adhesions, the results of a former peritonitis—did the inflammation begin in the ovary itself or in its environment? Was the morbid process centrifugal or centripetal? This is a question which the pathologist is often unable to decide, in spite of the importance which is assigned to salpingitis as a cause of pelvic peritonitis. In short, while we have seen that the ovary is exposed to disease through many different channels, it is difficult to affirm which causes were at work in any particular case.

Ovarian Hyperæmia and Hemorrhage.

Etiology.—Hyperæmia of the ovary occurs physiologically during menstruation and sexual excitement; being a relative condition, it is easy to see that a degree of congestion which would be innocuous in one individual might in another give rise to symptoms of a pathological character. Minor abnormalities within the ovary (localized indurations, cortical thickening, etc.) or the presence of slight peri-oöphoritic adhesions may cause such a disturbance of the inflow and outflow of blood as to give rise to intense hyperæmia when from any cause the pelvic organs receive a sudden increase of their ordinary supply. Chronic oöphoritis and displacement of the ovary on the one hand, and violent or excessive sexual intercourse on the other, are factors which are especially active in bringing about this condition. Masturbation and ungratified sexual appetite directly favor ovarian congestion; sudden suppression of the menses from cold or nervous shock is doubtless a cause. Intense hyperæmia of the glands is commonly found in the bodies of subjects dying with acute general peritonitis, even where

there are no surrounding adhesions or accompanying tubal disease; here it is merely a local expression of the general congestion.

Hemorrhage limited to a few follicles represents simply a local exaggeration of the general ovarian congestion; the follicle may have been enlarged in consequence of pathological processes, which would also tend to lessen the resistance of the vessel-walls, and thus to favor rupture under increased pressure. Torsion of the ovary may result in passive hyperæmia and follicular apoplexy, even in subjects of tender age; it is said to occur most frequently in cystic ovaries. It has been noted in heart disease and in cases of cerebral hemorrhage. General follicular hemorrhage is an expression of dissolution of the blood, and is accompanied by ecchymoses and hemorrhages from mucous surfaces. Typical cases are seen after extensive burns, phosphorus-poisoning, typhoid fever, etc. Extensive primary stromal hemorrhage is rare, except as an accompaniment of a general blood affection, such as scurvy. It is more apt to result from the rupture of a deep-seated hemorrhagic follicle. Punctate extravasations are seen in connection with either active or passive hyperæmia.

Anatomy.—The writer has seen a few specimens of ovaries which could fairly be regarded as the seat of simple hyperæmia. They were examined immediately after removal; one typical example presented the following appearances: It was slightly enlarged, more spherical in shape than usual, of a softer consistence than the average normal organ, the cortex having a purple color; the fimbriated extremity of the corresponding tube shared in the congestion. On section the cut surfaces presented a general deep pinkish hue, the vessels being unusually distinct, suggesting those seen on the periphery of a congested kidney. The most characteristic feature of the specimen was the œdematous condition of the stroma, which recalled that of a "wet brain." There was nothing especially striking about the microscopical appearances of the ovary, except that in a few spots there were undeniable evidences of ectasis and extra-mural collections of blood-cells, such as would have been found in any other highly vascular organ under similar circumstances. Neither the stroma nor the Graafian bodies presented any marked deviations from the normal.

Hemorrhage into the Ovary.

This may vary from a microscopical collection of blood-cells (really a diapedesis) to a true hæmatoma as large as a hazelnut, or even larger. For the sake of convenience we may regard the hemorrhage as follicular or interstitial. The first variety is easily explained. Hyperæmia and rupture of the peripheral vessels of the ripe vesicle is the physiological culmination of the menstrual nisus; excessive congestion

and the escape of blood from the larger deep-lying veins into one or more unruptured vesicles represent deviations from the normal. Although this accident doubtless occurs, as a rule, during the monthly period, it is evident that any local causes which determine an excessive flow of blood to the gland may be held responsible for it (violent or excessive intercourse, ungratified sexual desire, etc.), while the factors which lead to localized hemorrhages in other organs (obstruction to the general circulation, profound alteration of the blood from disease or noxious drugs) are equally active here.

The writer is inclined to believe that follicular hemorrhage is of comparatively common occurrence, but that it is necessary to exercise some care in discriminating between the normal and the abnormal; that is, between the small clot formed in a ruptured vesicle after the escape of its contents and the large coagulum which represents an excessive escape of blood after rupture. Where the vesicle is unruptured the diagnosis will be plain. In other cases the size and position of the clot, the presence of the corpus luteum, and the absence of other hemorrhages will point to the true condition. The escape of blood may be secondary to the enlargement of the Graafian body; in other words, the hemorrhage may take place into a cyst. A microscopical examination of the fluid might throw light upon this point.

The gross appearance of an hæmatoma ovarii is characteristic (Fig. 294). The organ is enlarged and irregular in shape, the irregularity being due to the projection above its surface of one or more dark-red or purple bodies, varying in size from a pea to a hazelnut, or even a pigeon's egg. If one of these cysts has ruptured, a portion of its contents may have escaped into Douglas' pouch, forming an hæmatocele, or adhesive inflammation may close the opening in the sac. Follicular hemorrhage is doubtless a frequent cause of intra-peritoneal hæmatocele, which may terminate fatally at once or from subsequent peritonitis. Scanzoni reports the case of a young girl who died from hemorrhage from a ruptured ovisac, six pounds (!) of blood having escaped into the peritoneal cavity.

Fig. 293.

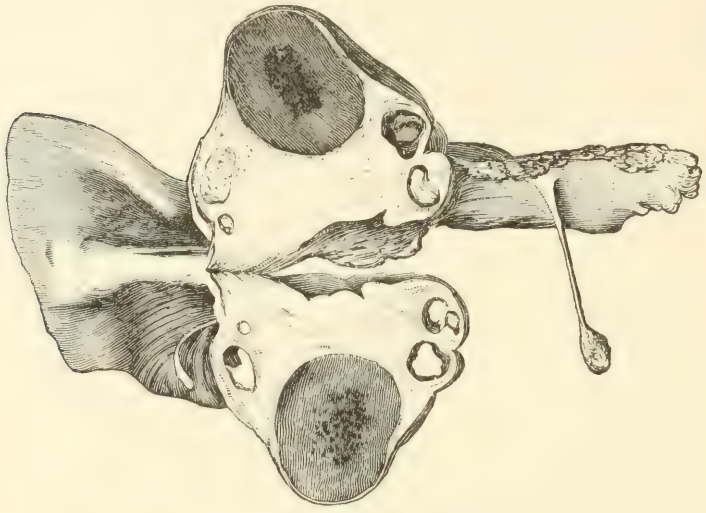
Follicular Hemorrhage of the Ovary; death from extensive burn (Winckel).

When fresh, the contents of an unruptured cyst consist of dark fluid blood; this rarely forms a true clot, as in a ruptured ovisac, but gradually assumes a chocolate color and a honey-like consistence, similar to that of the contents of the multilocular cystomata. The writer has found such a collection of fluid in the centre of an ovary, where it had doubtless existed for a long time without any signs of absorption. In

the course of time the contents of the cyst may be so far absorbed and disintegrated that nothing remains to mark its site but a small collection of granular pigment, or the coloring matter of the blood may be absorbed and a turbid serous fluid may remain. The peculiar fatty degeneration of the corpus luteum is absent.

It is claimed by some pathologists that follicular hemorrhage is a

FIG. 294.



Hæmatoma of Right Ovary (Winckel).

cause of cystic degeneration, but it seems more rational to regard it as a secondary accident. The writer has never been able to find the site of the ruptured vessel in the cyst-wall.

Hemorrhage into the stroma is of rare occurrence in comparison with the foregoing. It may be primary (the result of venous congestion) or secondary to follicular apoplexy; the latter condition would be suspected if a single collection of blood was found near the periphery of the organ, even when the remains of the cyst-wall had disappeared, while the former would be indicated by numerous punctate hemorrhages more central in their location and associated with general vascular engorgement and œdema. Extensive primary hemorrhage at a single point in the stroma is certainly very rare, if it occurs at all; specimens have been removed from subjects dying of scurvy and typhus in which the entire ovary was transformed into a mass of coagulated blood, but the change doubtless began by the occurrence of minute apoplectic foci, which eventually coalesced to form a single collection of blood. In the course of the diseases mentioned, in which general disintegration of the circulatory fluid occurs, there may be no actual rupture of vessels, but simply a general sweating, so to speak, through the

vascular wall, so that, in the words of Olshausen, "the entire stroma is like a sponge saturated with blood." In this case the ovary merely shares in the general ecchymotic condition; the element of increased pressure or congestion is not especially prominent.

It is probable that excessive hyperæmia, such as is induced by more or less complete obstruction of the venous return, may culminate in ovarian apoplexy; such a result would be more likely to follow obstructions from local causes (pressure of tumors, pelvic adhesions, etc.) than from diseases which produce general circulatory disturbances (cardiac, pulmonary, or hepatic lesions, malignant disease of the omentum). Possibly the axial rotation of enlarged ovaries may account for hemorrhage the origin of which is otherwise unknown. From the occurrence of hæmatoma ovarii in connection with marked ovarian and tubal disease it is fair to infer that the latter bears a direct causal relation to it; in fact, some of the complex symptoms observed at the time of menstruation in patients with recognized disease of the appendages, especially transient evidences of collapse, may be due to periodical intra- as well as extra-ovarian hemorrhages. With our present indefinite knowledge concerning the relation between ovarian symptomatology and pathology we can only indulge in speculations on this subject. Since stromal hemorrhage has been observed in the fœtus (as in a case reported by Schultze), it is evidence that its origin is often entirely unknown.

The anatomical appearances of ovaries that are the seat of old or recent stromal apoplexy vary according to the severity of the lesion. The organ may be of normal size, or but slightly enlarged, and may present on median section only a general reddish hue, such as is observed in hyperæmia, with here and there a minute reddish point that represents a collection of blood. Under the microscope the vessels will show local dilatations, with occasional extra-mural groups of red disks or blood-pigment. The rather common occurrence of the latter in ovaries that present no marked evidences of disease leads to the inference that localized hemorrhages or extravasations are not infrequent, and possess but little pathological significance.

Symptoms.—The symptoms of this condition are those of hyperphysiological pelvic congestion *plus* certain disturbances referable to the ovary. Menorrhagia in a young, ardent unmarried woman (who complains of no pelvic trouble except at her periods), associated with throbbing pain in the region of the ovaries and various reflex disturbances (pelvic and mammary neuralgiæ and pain extending down the back of the thigh), may be regarded as indicative of ovarian hyperæmia. The important points are the acute nature of the symptoms, their sudden development at the menstrual period, or in connection with pelvic congestion from other causes, the locality and character of the pain,

and the absence of symptoms of oöphoritis or peri-oöphoritis (rise of temperature, etc.). This condition may be suspected in newly-married women, previously healthy, who exhibit symptoms such as have been described. The dyspareunia and ovarian hyperæsthesia sometimes seen in young prostitutes is doubtless referable to the state of chronic congestion in which their ovaries are kept; in the latter class of patients, however, the pre-inflammatory stage is soon passed.

Hemorrhage into the ovary gives rise to symptoms only when rupture occurs. According to the amount of blood which escapes into the peritoneal cavity, the patient's condition varies from one of moderate shock to alarming collapse. As before remarked, it is probable that some of the obscure attacks of pain and transient collapse in patients at the menstrual period, who recover perfectly without subsequent peritonitis or evidences of tubal trouble, are due to small hemorrhages from the rupture of sanguineous cysts, the blood from which is rapidly absorbed by the peritoneum without leaving any traces, just as the venous oozing after laparotomy is innocuous, even though one or two ounces of blood may collect in Douglas' pouch.

The rupture of a large hæmatoma ovarii may be followed by a rapidly fatal result, as in a case reported by Boivin and Dugés, where the patient was suddenly seized with violent pain in the abdomen, collapsed, and died in a few hours, about fifty ounces of blood having escaped into the peritoneal cavity from the ruptured ovary. The symptoms under these circumstances will be those of hæmatocele.[1]

Diagnosis.—The diagnosis of ovarian hyperæmia is mainly a matter of inference, depending upon the previous history of the patient (with regard to the absence of previous ovarian trouble) and the sudden development of ovarian pain and tenderness in connection with intense pelvic congestion, as shown by menorrhagia, especially at the menstrual period. The local examination may or may not serve to confirm the opinion derived from the clinical history. Under favorable circumstances the ovary may be found by bimanual palpation to be enlarged and extremely tender. Pressure upon it aggravates the pain, and may lead to increased excitement and reflex symptoms. The absence of evidences of an acute inflammatory process is of some value.

Secondary congestion in chronically diseased ovaries may be inferred from signs of periodical local disturbances, tubal disease being excluded. In cases of disease resulting in dissolution of the blood the sudden appearance of ovarian pain, associated with the development of a movable tumor at the site of the ovary, would point at once to general follicular apoplexy. The shape and position of the tumor distinguish it from a small hæmatocele between the folds of the broad ligament; such a collection of blood would be less circumscribed, and would

[1] See Vol. I. pp. 745 and 749.

tend to gravitate to the base of the ligament. Hemorrhage may take place into a small ovarian cyst or cystic ovary, but in this case the existence of ovarian disease and enlargement would probably have been noted previously. The sudden development of symptoms of internal hemorrhage in a case of this kind must leave little doubt as to the occurrence of rupture of an hæmatoma ovarii, although, under the influence of the menstrual nisus, the source of the hemorrhage might lie external to the ovary—in the veins of the pampiniform plexus, etc.

Prognosis.—In young girls whose ovaries are anatomically sound abnormal congestion may be corrected before the occurrence of organic changes. In women who practise sexual intercourse habitually, even under lawful conditions, the prognosis is less hopeful unless a complete and sufficiently prolonged cessation of disturbing influences can be effected. Pregnancy may effect a cure, but this cannot be predicted with certainty. Even when uncomplicated, prolonged hyperæmia may result in acute oöphoritis, or more often in chronic disease of the ovaries, which completes the vicious circle by increasing in its turn the periodical congestion which originally led to it. When localized peritonitis and tubal disease are superadded the patient's condition is discouraging.

Treatment.—This is mainly prophylactic, but varies with the age and character of the patient. If a young girl manifests precocious sexual activity and a tendency to hyper-physiological monthly congestion, this should be corrected by the formation of proper mental as well as physical habits. Vicious practices, especially masturbation, should be eliminated, as well as such books and associations as tend to inflame the passions. Perfect rest should be enjoined just before and during the first day or two of the menstrual period. A combination of the bromides will be found to be useful to allay ovarian congestion; menorrhagia is seldom so severe as to require the administration of ergot, hydrastis, or dilute sulphuric acid. The use of opium or stimulants is seldom advisable, as the habit of taking them at every period may readily be formed at an early age. A small blister may be applied over the tender ovary, but other local treatment is inadvisable in the case of young girls, whose thoughts should be directed as much as possible away from their pelvic organs. Constipation should be carefully avoided. Arsenic and strychnine are good general tonics. Marriage offers a natural means of cure in cases of hyperæmia due to ungratified sexual desire, where the trouble is not attributable to actual organic disease of the ovaries. In married women the temporary suspension of marital relations is often necessary. Hot vaginal douches and the usual astringent or alterative applications to the fornix, adjacent to the affected organ, are valuable adjuvants in the treatment. The direct application of a mild constant current has given satisfactory results in these cases.

Acute Oöphoritis.

Etiology.—Acute inflammation of the ovary is usually secondary to inflammation of the surrounding tissues, although in a certain proportion of the cases it originates within the gland. Primary oöphoritis, as will be inferred, being an inflammation beginning in the depths of the stroma, must be ascribed to some circumscribed vascular disturbance, or it may be the local expression of some general infection. Follicular or parenchymatous oöphoritis is not seldom observed in the acute exanthemata, in cholera, in septicæmia, and after phosphorus- and arsenic-poisoning. One or both ovaries may be affected. Extensive inflammation of the stroma as the result of general infection is rare outside of the puerperal state; it is sometimes found in cases of septic peritonitis where the absence of peri-oöphoritis shows that the trouble has originated within the gland itself.

Sudden suppression of the menses as a result of cold certainly gives rise to hyperæmia and acute inflammation of the ovaries, which in a few cases may result in abscess. Gonorrhœa has been mentioned as a not infrequent cause, but the ovarian trouble in the case is clearly secondary to disease of the tubes. Sexual excess leads to congestion and subsequent inflammation of the glands, as those will testify who have frequent opportunities to examine young prostitutes where gonorrhœal infection can be excluded.

Acute oöphoritis is often secondary to disease of the tubes and peri-oöphoritis, the sequence being clear. In cases of death from diffuse peritonitis following septic infection of wounds in the lower genital tract, the ovaries will frequently be found to be the seat of acute suppurative inflammation. This is the usual history of the fatal results of minor operations, such as the passage of a sound, curetting, incision of the cervix, hystero-trachelorrhaphy, etc. The presence of recent peri-oöphoritis points to the secondary nature of the affection. Pyosalpinx is sometimes accompanied by this condition of the ovaries; abscess is present more frequently than was formerly supposed. However, the ovarian trouble is more often of a chronic character, being due to long-continued pressure from old adhesions.

Puerperal oöphoritis is the most common variety. It may be primary, being an expression of the general septic infection, or may be secondary to general peritonitis. It is usually bilateral, and often results in complete necrosis of the organ and abscess-formation. The inflammation of the tubes may be insignificant (catarrh) as compared with the virulent processes in the peritoneum and ovaries.

Anatomy.—Pathologists recognize two varieties of acute inflammation of the ovary—the follicular and the interstitial. It is safe to affirm that a sharp distinction between the two can only be drawn in

the lesser degrees of the affection, since the stroma and ovisacs are so intimately related that one shares in any suppurative process in the other.

In the mildest form of follicular inflammation the primordial follicles alone are involved, the stroma surrounding them being slightly hyperæmic, but otherwise unchanged. The liquor folliculi becomes turbid. On microscopical examination the epithelial cells are seen to have undergone cloudy swelling and present a granular appearance, and the zona pellucida is somewhat thickened. The destructive character of the process is indicated by granular degeneration of the ovum and disappearance of the germinal vesicles. The size, consistence, and external appearance of the ovary are unchanged. When the inflammation is more severe and general many or all the ovisacs are affected; when the gland is somewhat enlarged (rarely to such an extent as to be recognized clinically) and feels softer than usual, it presents on inspection the same appearance as in hyperæmia; if there is suppuration of the superficial ovisacs, localized peri-oöphoritis may be present, a layer of organized lymph being deposited over the inflammatory foci. On section the stroma presents a general congested appearance, the fine vascular networks being injected, especially in the immediate vicinity of the inflamed follicles. It is but a step from this stage to interstitial oöphoritis. The liquor folliculi is transformed into a puriform fluid. A section of a suppurating follicle shows the following changes: The membrana propria is thickened, while the granulosa has almost entirely disappeared, its degenerated epithelium being largely replaced by young cells. The contents vary from a cloudy fluid loaded with granular débris to true pus. Slavjansky[1] regards hemorrhage into the diseased ovisacs as a rare sequela; extravasations, if they occur, are limited to the granular layer, the admixture of blood in the liquor folliculi being accidental, and coming from the vessels divided in cutting the section (?). In the ring of stroma surrounding the follicle there is marked engorgement of the vessels and even punctate hemorrhages and collections of leucocytes.

In interstitial oöphoritis the inflammation begins in the stroma, but soon extends to the ovisacs. It may exhibit every shade of intensity, from intense hyperæmia to complete necrosis (*putrescentia ovarii*). In the less severe forms the ovary is enlarged (to twice its normal size), is soft, and of a reddish or even dusky hue, but there is no attending peri-oöphoritis. On section the appearances are identical with those described under hyperæmia, but the moist, œdematous condition of the cut surfaces is more marked; the ovisacs are unaltered. Microscopically, we note vascular engorgement, extravasation, and infiltration of the stromal interspaces with leucocytes. In the stroma itself

[1] *Archiv für Gynäkologie*, Bd. iii., 1872, p. 183.

the spindle cells are increased in number, but appear smaller than normal and irregular in their distribution, while the connective-tissue cells are enlarged as well as more numerous. As the inflammation becomes more severe the ovary is not only more swollen (sometimes to three or four times its usual dimensions), but lymph is deposited on its exterior in consequence of the accompanying peritonitis. On section, minute yellow points and lines may be observed throughout the stroma, especially in the neighborhood of the hilum, from which they seem to radiate, while numerous punctate hemorrhages are appreciable to the naked eye (*oöphoritis hæmorrhagica*). The follicles show the cloudy and granular degeneration before described. Under the microscope the stroma is seen to be crowded with leucocytes, which occupy the interstices between the fibro-muscular bundles and form small abscesses. Hemorrhagic foci are more or less frequent. The subsequent advance of the inflammation may result in the formation of one or more abscesses of considerable size, or in transformation of the entire ovary into a pulpy mass, which on section presents the ordinary appearances of gangrene, all trace of the original structure being lost. The latter condition is seen in bad cases of puerperal septicæmia, especially where the organ is buried in exudation and its vascular supply is cut off.

Although we are unable, for lack of opportunities, to study the different steps of the process anatomically and to state positively the exact mode of resolution in acute inflammation of the ovary, we can infer from the final condition what the intermediate steps must have been. As before stated, the lesser degrees of acute oöphoritis are undoubtedly more common than is usually taught; at least we must assume this from an examination of ovaries usually described as being the seat of chronic disease and a comparison of the results of clinical and anatomical facts. In slight follicular inflammation the follicular wall may be thickened, as well as the surrounding stroma, so that, being unable to discharge its contents, the ovisac develops into a cyst, as will be described later; or the fluid may be absorbed and the follicle may contract and finally disappear, leaving a scar or depression to mark its site. The cicatrix resulting from the destruction of such a central ovisac may closely resemble a corpus fibrosum; indeed, Slavjansky applies this term to it, although Patenko used it originally in connection with a non-inflammatory degenerative process in the follicle. If there were many of the fibrous bodies the entire ovary might be cirrhotic. The slight adhesions which accompany follicular oöphoritis may be sufficient to imprison the ovary, but they seldom interfere with its vascular supply or impair its functions.

In mild interstitial oöphoritis (the non-septic form) resolution may be complete, as in other organs, but after changes have taken place in the cells of the stroma there is the usual hyperplasia which attends

inflammation of fibro-muscular tissue, the ovary being permanently enlarged. This sequela is rare; cirrhosis, from contraction of the new-formed connective tissue, is more frequent. Localized thickenings in the stroma result from scattered foci of inflammation; the stroma between them may be histologically normal.

Abscess-formation in the ovary is comparatively infrequent, but not so rare as has been stated. There may be one or several abscesses, and they are usually found only in one ovary. A true abscess-cavity with a pyogenic membrane is rarely found, except in cases of long standing; if superficial, the wall of the sac is thickened externally by the adhesions in which the ovary is buried. Histologically, ovarian abscess does not present any special peculiarities. Its contents consist of pus, mixed with blood (from secondary hemorrhages), broken fibrous tissue, sloughy material, and granular débris. The origin of such an abscess from an extravasation is purely hypothetical.

Symptoms.—It is only exceptionally that acute inflammation of the ovary presents symptoms which are not merged with those of localized peritonitis. Even where no peritonitis is present, as in the follicular form accompanying certain blood diseases, the trouble remains latent or is masked by the serious general disturbance. Perhaps the most typical case would be one in which prolonged hyperæmia of the ovary resulted in actual inflammation, the symptoms referable to the former condition becoming aggravated and having added to them subsequently evidences of localized peritonitis. The symptoms of abscess-formation in the ovary are rather more definite, since after the subsidence of the peritonitis (especially if the latter has been of gonorrhœal origin) there remain local tenderness, fever, and sometimes a tumor. The differential diagnosis between this condition and pyosalpinx or pelvic abscess proper is extremely difficult, and will be considered subsequently.

The fact that the pain is limited to one side would point to the ovary as the seat of trouble. In a well-marked case of acute oöphoritis, due, for instance, to sudden suppression of the menses, the patient complains of severe shooting pains in the ovarian region, increased on deep pressure. According to the neurotic character of the subject, she may or may not have various reflex disturbances, especially mammary and vesical. Frequent and painful micturition is noted, while the passage of feces through the rectum (especially if the ovary is displaced so as to lie in contact with it) is attended with great pain. The knee is drawn up on the affected side, and tension of the abdominal muscles results whenever an attempt at palpation of the affected side is made. If the pain can be differentiated from that caused by peritonitis, it may be described as more localized and of a peculiarly boring character. The occurrence of nausea in cases where the peritonitis was not

general would point to trouble in the ovary, which is well known to give rise to this symptom. An examination of chronically diseased ovaries removed by laparotomy will make it evident that recurrent attacks of acute inflammation undoubtedly occur in such organs where the symptoms are masked by those referable to tubal disease and resulting perioöphoritis. The development of a localized abscess with discharge of its contents into the rectum, bladder, and less often into the vagina, after disappearance of the symptoms of peritonitis, would point to probable suppuration in the ovary. The sympathy between the ovaries and the parotid glands has been noted by several observers; cases have occurred in which oöphoritis alternated with parotitis. This phenomenon might furnish a clue in obscure cases.

Diagnosis.—As will appear from the foregoing, the subjective symptoms of acute oöphoritis are rarely sufficiently clear to permit a positive diagnosis. The pain is not pathognomonic, although, as distinguished from that due to peritonitis, it is more of a neuralgic character, and is apt to be accompanied by referred pains in the corresponding thigh, the mamma, etc. If strictly unilateral and localized in the ovarian region, it becomes a more valuable indication. If the patient is known to have had similar attacks at the time of the menstrual period (gonorrhœa and sepsis being rigidly excluded), a diagnosis of acute ovarian trouble is justifiable, although peri-oöphoritis may none the less account for the symptoms. Physical examination of the patient unless she is under ether is practically useless, since, even if tympanites is moderate, the abdominal muscles are kept so rigid that bimanual palpation is out of the question. Hence the importance of administering an anæsthetic, especially if operative interference is contemplated.

Now that surgeons do not hesitate to open the abdomen in case of need, even in acute peritonitis, the propriety of using every means to arrive at a fairly accurate diagnosis is evident. If the attendant has examined the patient before the attack, he will be able to judge whether there has been any change in the size or consistence of the ovary which is supposed to be the seat of trouble; more important still, he can exclude suppuration in a pre-existing cyst (dermoid or cystoma), which might readily be mistaken for ovarian abscess if its presence in the pelvis was not previously known.

Cases of puerperal oöphoritis have been reported in which the enlarged, tender ovaries were clearly mapped out at the sides of the enlarged uterus. If a globular, well-defined mass, fixed or movable, is felt at the side of the uterus, but separated from it by a distinct interval, it is probably the affected ovary. The almost invariable presence of perioöphoritis, which not only surrounds and fixes the diseased gland, but commonly fuses it and the corresponding tube into a shapeless mass, renders an exact diagnosis extremely difficult if not impossible.

The recognition of ovarian abscess is not so difficult. It depends upon the development of a tumor in the ovarian region, preceded by the symptoms of acute ovarian and peri-ovarian trouble previously described. The acute symptoms may subside, but repeated chills, fever of a remittent type, gradual decline of the health—in short, the usual evidences of a suppurative process within the pelvis—indicate that the disease has assumed another form. Examination shows that the mass previously assumed to be an inflamed ovary has increased in size, and is perhaps as large as an orange, while fluctuation can be detected more or less clearly according to the locality of the tumor.

The differential diagnosis lies between suppuration of the ovary, suppurating cystoma or dermoid cyst, enlargement of the tube, and parametric abscess. The history of the case will afford a clue to the true condition. Even if a cyst was not known to exist before the occurrence of the acute symptoms, suppuration would hardly take place in it so rapidly, and the tumor would not be so acutely sensitive as the inflamed ovary. Tubal enlargement is more chronic in its occurrence, the symptoms are less acute, and the tumor is more elongated in shape, lies nearer to the uterus, and is usually less clearly defined, on account of the dense adhesions which surround it. Pyosalpinx is attended with recurrent attacks of peritonitis which often leave the tumor no larger than before; abscess of the ovary, on the contrary, tends to a rapid development and a termination by rupture. On palpation, pyosalpinx (hydrosalpinx is not often attended with symptoms of acute inflammation) gives more of a doughy sensation, a suppurating ovary being tense and fluctuating.

Small pelvic abscesses may closely resemble those located in the ovary. But the former are fixed, while a suppurating ovary may be movable, are less circumscribed, and bear a closer relation to the vaginal vault, which generally presents that peculiar hard, rigid condition with which the gynecologist is so familiar. In a doubtful case the cautious use of a fine aspirating needle is justifiable; that is to say, when the tumor is easily accessible through the fornix. The writer observed a case of unsuspected extra-uterine pregnancy (that had probably existed for years), with inflammation and suppuration of the sac following an attack of pelvic peritonitis, in which the symptoms closely simulated those of ovarian abscess. The small mass at the side of the uterus had always been regarded as a prolapsed ovary.

The subsequent history of a case of supposed acute oöphoritis may furnish proof of the correctness of the original diagnosis. In other words, if a woman after recovering from an attack such as has been described is left with one or both ovaries enlarged and sensitive, or perhaps small and cirrhotic (as proved by subsequent menstrual disturbances), it may be fairly assumed that she had inflammation in the

organs themselves as well as in the peritoneum surrounding them, and that this inflammation has resulted in the condition known as chronic oöphoritis.

Prognosis.—In puerperal cases the involvement of the ovaries does not influence the already grave prognosis. Primary acute oöphoritis, even when it ends in suppuration, is by no means necessarily fatal, although the presence of doubt as to the point at which the abscess may rupture always renders the outlook a serious one. If the trouble is localized in the ovary and the adjacent peritoneum, it may entirely subside, although the results unfortunately remain. While pelvic exudations may in time become more or less completely absorbed, so that the imprisoned organs again attain nearly their normal range of mobility, an ovary once the seat of acute inflammation is never restored to full functional usefulness. The only sign of the former inflammation may be cortical induration or a localized thickening of the stroma, but the delicate gland has had its usefulness permanently impaired. Even if the patient is not rendered liable to a recurrence of the original trouble, the acute often passes over into a subacute oöphoritis which terminates in general cirrhosis. Complete "resolution," such as occurs in other organs, probably never takes place in the ovary. Consequently, though we may not take a gloomy view of acute oöphoritis as regards actual danger to life, we cannot promise the patient a "cure," but must rather predict more or less constant ovarian trouble. If both ovaries are affected, she will probably be sterile, not alone because of the extensive intrinsic changes, but by reason of the accompanying perioöphoritis. If the inflammation is secondary to specific salpingitis, the outlook is still less promising.

Abscess of the ovary does not by any means invariably rupture. Every laparotomist has removed specimens which had doubtless been safely buried in adhesions for months. Absorption or caseation occurs here as elsewhere, provided the patient's vital powers do not succumb to the drain. Unfortunately, these abscesses rupture into the peritoneal cavity with a frequency which is in striking contrast to the history of ordinary pelvic abscesses. This is probably due to the fact that the former are not immediately adjacent to the rectum and vagina, as are the latter. Ovarian abscesses rupture most frequently into the large intestine in the neighborhood of the sigmoid flexure, and usually close promptly after complete evacuation of their contents. If the pus has been long retained and the walls of the abscess-cavity are thick, a permanent fistula may remain. Sometimes the abdominal wall is perforated.

Treatment.—The medicinal treatment is the same as that recommended in peritonitis—*i. e.* applying ice-bags or the cold-water coil to the abdomen in the earlier stage of the inflammation, and hot poultices

later. Some practitioners apply leeches over the seat of pain. Blisters should certainly be rejected, as increasing the patient's sufferings without accomplishing any definite results. Opium is now used sparingly, if at all, by those who have much experience with acute peritonitis; it is much better to rely on early and frequent depletion of the intestinal tract by salines, aided, if need be, by turpentine enemata. If the temperature is high, antipyretics (antifebrin or antipyrin) should be given, while the ice-cap will be grateful to the patient. Generous diet and stimulants, as indicated by the pulse, are most important; signs of abscess-formation should be constantly sought for. The usual teaching is to aspirate the abscess through the vaginal roof if possible, and afterward to establish a free opening and wash out the sac with antiseptic solutions. It is evident that unless the abscess is on the point of rupturing externally, search for pus in the tumor is attended with more or less danger to the surrounding parts.

While the treatment of these cases must depend largely upon the experience and boldness of the surgeon, the tendency of modern gynecologists, even such a conservative teacher as Winckel, is to follow the example of Tait, who says: "In the event of the attack appearing to threaten the life of any patient under my care, I would not hesitate to open the abdomen, cleanse out the cavity, and possibly remove the diseased organs. When an ovarian tumor is gangrenous or suppurating, we serve the patient by promptly removing it; and I do not see why this principle should not be extended. The result of the disease is nearly always to destroy the functions of the glands, and therefore in prospect of a fatal issue of the disease the argument against an operation, that it will unsex the patient, need not be considered."

Chronic Oöphoritis.

The expression "chronic oöphoritis" is more or less misleading, since it conveys the impression of an active inflammatory process, whereas it is more often intended to apply to an anatomical change in the ovary resulting from previous inflammation. But this confusion of terms is peculiar to pelvic pathology, as in the use of the word "perioöphoritis" to describe at once localized peritonitis and the resulting adhesions around the ovary. "Salpingitis" is applied quite as loosely both to acute inflammation of the mucous membrane lining the tube and to the hypertrophy of its wall resulting from such inflammation. More properly, such inflammatory processes in the ovary as are not of an acute character are really subacute. The reader will find it simpler to regard the change in the organ considered in this section as an "end-process," which, however, is not necessarily permanent, since it may be modified by subsequent attacks of acute inflammation. In the

same ovary we may find side by side evidences of acute inflammation and of atrophy or cirrhotic change due to former active disease; in other words, an ovary may be subject to several fresh attacks or exacerbations of acute inflammation before it becomes entirely transformed into a mass of firm fibrous tissue.

To compare the process again with that of localized peritonitis, each recurring attack of peri-oöphoritis leaves the adhesions more dense and firm than before. Just as salpingitis may result in several different forms of tubal enlargement—which are named, according to the character of the contents of the tube, hæmato-, hydro-, or pyosalpinx, or from the thickening of the wall "pachysalpingitis," interstitial salpingitis, hypertrophy, etc.—so the ovary as the result of acute or subacute inflammation may present several forms. It may be smaller than normal (cirrhosis), or may be considerably enlarged, so as to fairly deserve the name tumor. This enlargement may be at the expense of the fibrous stroma, of the Graafian vesicles, or of both. Separate names have been applied to these conditions according to the prominent feature of the enlargement (stromal or follicular), but these distinctions are more or less artificial, the process being essentially the same in every specimen, although the macroscopic results are different.

Etiology.—There is considerable difference of opinion as to the frequency with which acute oöphoritis terminates in the chronic form. The impossibility of obtaining exact data is due to the fact that the former affection is so often latent or masked by other conditions that the diagnosis is uncertain. That chronic oöphoritis is relatively frequent is evident from the fact that it has been noted in nearly five per cent. of all pelvic troubles. It is essentially an affection arising during the period of greatest sexual activity (twenty to thirty), and is to be referred primarily to frequent or prolonged pelvic hyperæmia, usually the active form. Hence it is commonly noted as a result of violent and oft-repeated intercourse, or of ungratified sexual excitement in single women or in the ill-mated. Increase of the normal menstrual congestion (suppression from cold) is doubtless a frequent etiological factor. Fibrous hyperplasia may follow repeated pregnancies for the same reason.

Chronic oöphoritis of secondary origin is more common than the primary form. Extension of the inflammation through the tubes, peri-oöphoritis, and resulting disease of the ovaries is a sequence often observed. Not that the chronic inflammatory process in the ovary partakes of the specific character of the salpingitis. Whether the latter is septic or specific, the localized peritonitis resulting is the same, and consequently the affection of the ovaries. The *modus operandi* is sufficiently evident. Not only is the circulation in the ovarian vessels impeded by the surrounding adhesions, thereby inducing in the

organ a condition of passive hyperæmia, but the tunica albuginea is so thickened that the ovisacs are prevented from rupturing, and either degenerate and disappear or form cysts. If the salpingitis and perioöphoritis are of an acute character, acute oöphoritis may occur, which in its turn results in cirrhosis or hyperplasia.

Disease of the ovary is a frequent accompaniment of all enlargements or displacements of the uterus by which the pelvic circulation is disturbed or obstructed. Hence the common enlargement of the glands in cases of subinvolution, retroversion, uterine fibroid, etc. In unilateral ovarian cyst the opposite ovary not infrequently shows evidences of disease, probably due to its increased functional activity. Prolapse of the ovary is at once a cause and an effect of chronic enlargement of the organ. It will be considered under a separate section. The usual reasons assigned for the more frequent enlargement of the left ovary are the pressure of fecal matter in the adjacent rectum and sigmoid flexure, and the fact that the left ovarian vein empties directly into the renal vein (instead of into the vena cava, as on the right side), there being no valves at the point of entrance. Both anatomical conditions directly favor venous obstruction in the ovarian plexus.

Thus far, we have referred to general disease of the ovary, whereby the normal gland is transformed into a mass of dense fibrous tissue, with or without accompanying cystic degeneration of the follicles. Evidences of localized inflammatory trouble are extremely common, and are explained in various ways. Small hemorrhages may result in the destruction of individual ovisacs or the formation of minute indurations in the midst of the stroma. These indurations (not true cicatrices) are situated most often at or near the periphery of the ovary, where their presence is explained by reference to slight peritonitic adhesions at opposite points on the surface of the organ. Localized thickenings of the cortex lead in time to cystic degeneration, as will be explained subsequently.

Individual ovisacs may become diseased from unknown causes, and after reaching the surface may either atrophy or rupture prematurely, leaving small indurations to mark their site; or the follicular membrane may be so thickened that rupture is impossible, the follicle enlarging to form a cyst perhaps as large as a walnut, while the rest of the ovary still remains functionally active. We know as yet comparatively nothing concerning the etiology of localized abnormalities of the ovary. It is not certain that we are justified in regarding them as inflammatory in their character. They may represent simply degenerative processes, such as are very common in the organ. The important practical point is that the presence of chronic oöphoritis must be inferred from the *tout ensemble* of the ovary, and not from one or

several localized indurations, which may not, after all, be pathological. The same may be applied to deductions based upon the presence of a few dropsical follicles in a gland otherwise fairly normal in appearance.

Gross Anatomy.—In describing the diseased ovary we shall consider the three different results of chronic inflammation—cirrhosis, fibrous hyperplasia, and follicular or cystic degeneration. While specimens are sometimes observed presenting examples of pure cirrhosis or hyperplasia, cystic degeneration is of course always accompanied by one or both of the other conditions; in fact, it is common to meet with all of these processes in the same ovary, which is only another evidence of the fact before stated, that in no case is an abnormal process within the gland confined strictly to either the stroma or the ovisacs.

Chronic interstitial oöphoritis has been compared to cirrhosis of the liver. Thus, Noeggerath (following Virchow) has described two stages —one in which the ovary is rather soft, smooth, and considerably larger than normal (comparable to the so-called hypertrophic period of cirrhosis), and a second stage, in which the gland becomes small, hard, and nodular, like a "hob-nail" liver. This view is an attractive one, but, unfortunately, the subject of ovarian pathology is still too obscure to allow us to state positively that certain anatomical appearances represent an early stage of chronic disease, and that certain other appearances belong to a more advanced one. As well say that we know why two ovaries placed under apparently the same conditions should be so essentially different in structure. Whether we accept the theory of progressive change from hypertrophy to cirrhosis, or assume that each form represents a distinct "end-result" of chronic oöphoritis, for practical purposes we may still consider three types of ovary—the atrophic, hyperplastic, and cystic.

Fig. 295.

Cirrhosis of the Ovary with Pyosalpinx (natural size).

Fig. 296.

Atrophy of the Ovary with Pyosalpinx (natural size).

A cirrhotic ovary resembles closely in size, shape, and appearance the normal gland that has undergone senile atrophy; indeed, cirrhosis is premature atrophy. But a careful inspection of the former will reveal evidences of pathological changes, while the greater thickening

of the tunica albuginea and the presence of peri-oöphoritis, which commonly attends cirrhosis, prove that it is not a physiological condition. A typical cirrhotic ovary is below the normal size, is hard and almost cartilaginous in consistence, and of an irregular, nodular shape. The senile gland, while it may also be nodular, still preserves the general shape of the healthy organ, the irregularities on its surface being due to the pits and cicatrices marking the sites of former Graafian vesicles. In this connection it should be stated that there are numerous variations as regards both shape and size: an ovary buried in a mass of dense adhesions may shrink to the size of a bean, while as a result of long-continued pressure it may assume a fusiform shape or may be completely flattened. The grayish or pinkish-gray color of the healthy ovary is changed to a general grayish-white or pearly hue, sometimes relieved by reddish spots which indicate local hyperæmia.

When studied more in detail, it will appear that the firm consistence of the ovary is due to the increase in thickness of its cortical portion; this thickening is referable partly to the organized lymph that has been deposited upon the outer surface, but more to intrinsic changes. The adhesions from former peritonitis may be represented by slender threads easily separated from the ovary, or by dense cicatricial tissue, in which it is so firmly imbedded that in tearing away the organ fibrous bands adhere to it. The irregularities on the surface of the diseased gland are of different sizes, since they represent the cicatrices remaining after the rupture (or more frequently degeneration without rupture) of dropsical ovisacs, which could not discharge their contents properly because of the thickening of the tunica albuginea. Small papillary masses, like sessile subperitoneal fibroids, may be seen projecting from the surface; these are merely localized thickenings of the albuginea, and are partly the result of cicatricial contraction of the surrounding tissue. In a specimen showing general cirrhosis all traces of cysts have disappeared, but in many cases where the atrophic change has not involved the entire gland a few Graafian vesicles or their remains may be observed. On section the abnormal thickness of the tunica albuginea will at once attract attention; it may be several millimeters. The thickening is seldom uniform, an increase at one or more points being due either to greater induration of the stroma or to the presence of an external layer of organized lymph.

The cut surface of a cirrhotic ovary usually presents a uniform fibrous appearance, like a section of a fibroma. Unless there is localized hyperæmia, its color is whitish rather than pinkish (as in the normal ovary), the paucity of blood-vessels being apparent to the naked eye. Dropsical follicles may be imbedded in the midst of the stroma; less often they lie near the periphery beneath the thickened tunica.

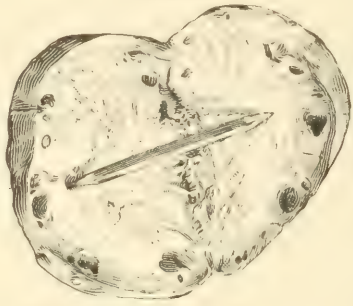
Specimens of considerable enlargement of the ovary due to pure

fibrous hyperplasia are not common. Most of the supposed examples of this form of hypertrophy will be found to be mixed types, cystic

Fig. 297.

Cut Surfaces of a Cirrhotic Ovary (natural size).

Fig. 298.



Fibroid Hypertrophy of the Ovary (natural size).

degeneration predominating. There is considerable difference of opinion among writers as to the identity of fibrous hyperplasia and true fibroma of the ovary, some holding that the latter (especially if of moderate size) is not a neoplasm at all, but simply a proliferation of the stroma resulting from some previous inflammatory process. Thus Olshausen[1] says of ovarian fibromata: "They can never be isolated, like fibro-myomata of the uterus, from the mother structure, but are hyperplasiæ of the stroma, diffuse connective-tissue neoplasms, which are partly the result of acute or chronic inflammatory processes." Patenko[2] thinks that a fibroid arises by the enlargement and coalescence of several corpora fibrosa, the latter developing from corpora lutea and sometimes from degenerated follicles. The origin of large fibromata from the ovary is, he thinks, "more than doubtful." While there is sometimes great difficulty in deciding this point in the case of small tumors—in fact, where the entire ovary is affected it is impossible—Virchow's description of these growths shows how readily they may be mistaken for the inflammatory enlargement. "The portion of the ovary which is not involved in the formation of the tumor," he says, "very often presents the changes of chronic oöphoritis in all its forms. Not only is the stroma generally indurated, but the albuginea is thickened and sclerotic, and the follicles are converted into corpora fibrosa." The form of hypertrophy referred to here is that of general, uniform enlargement of the ovary to dimensions two or three times that of normal, the gland still

[1] *Krankheiten der Ovarien*, last ed.

[2] "Ueber die Entwicklung der Corpora Fibrosa in Ovarien," *Virch. Arch.*, Bd. lxxxiv. For literature, see also Coe: "Fibromata and Cysto-fibromata of the Ovary," *Am. Journ. Obstet.*, Oct. and Nov., 1881, and "A Case of Fibro-cyst of the Ovary," *ibid.*, July, 1882.

preserving to a considerable extent its normal shape and relations, while on section peripheral ovisacs or their remains are visible. As before stated, some observers are disposed to regard this form of enlargement as an initial stage of cirrhosis—a point which it must be extremely difficult to prove to one's own satisfaction, since, clinically, enlarged, hard ovaries may remain *in statu quo* for years unless they are finally removed by abdominal section, apparently not larger than when they were first detected.

From the fact that cirrhotic ovaries are commonly buried in dense adhesions, while those that have undergone fibrous hyperplasia are more often free from imprisoning bands of lymph, as well as from the absence of positive evidence, either clinical or anatomical, of any transition stage, we are warranted in inferring that it is not safe to reason by analogy in the case of such a complex organ as the ovary. Instead of constructing a theory to harmonize the different forms of ovarian disease, it seems simply to infer that chronic oöphoritis sometimes results in atrophy (especially where the circulation is interrupted by peri-ovarian adhesions), and sometimes in hypertrophy, the difference in the two forms being determined by the diminution or increase of the blood-supply. Cystic degeneration, being an expression of hypernutrition, would naturally be more frequently associated with the latter variety.

A typical hyperplastic ovary is usually free from adhesions, prolapsing simply from its weight, and only contracting adhesions in case of secondary peritonitis. In genuine cases of fibrous hypertrophy the tube is not usually the seat of disease; in fact, the ovaries which are so commonly found fused together with diseased tubes are rarely of the pure fibrous type. The affected gland is ordinarily as large as a walnut; it may be oval, more often is globular in shape, has a smooth exterior (sometimes slightly nodular), and a peculiar hardness which is readily appreciable on vaginal examination; even by the touch the difference between such an ovary and one enlarged by reason of cystic degeneration is quite apparent. The surface may or may not bear evidences of former ovisacs. In short, the tumor resembles closely a small pedunculated fibroma of the uterus. This analogy is borne out on section of the ovary, which cuts with that peculiar sensation characteristic of fibrous growths. The cut surface may present no resemblance whatever to that of the normal gland—only firm, dense connective tissue, interlacing in all directions as in pure fibroma. There is no evidence of hyperæmia or subacute inflammation. The tunica albuginea may be distinguishable from the deeper portion of the stroma, but sometimes there is no distinct line of demarkation. Cysts, if present, are usually few in number and are situated just beneath the tunica (see Fig. 298). Their walls are much thickened. They are readily

distinguished from the irregular cavities or "geodes" in commencing cystic degeneration of ovarian fibroids.

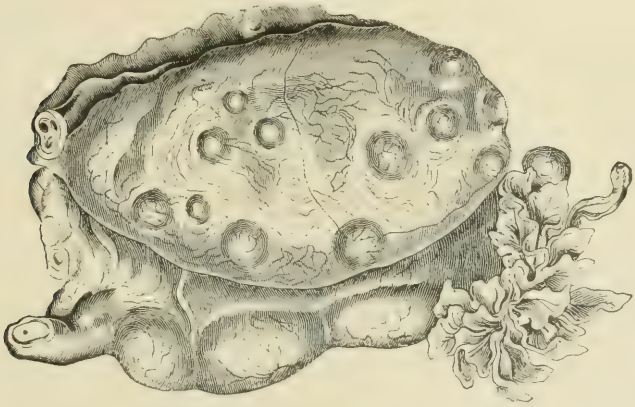
In describing a "cystic" ovary we must exclude, on the one hand, one that varies in appearance from the normal only by reason of the presence of a few enlarged peripheral vesicles, and on the other a small ovarian cyst. A consideration of the mode of origin of the latter belongs elsewhere, but it may be positively affirmed that cystic ovaries rarely develop into large cystomata by the dropsical distension and coalescence of adjacent ovisacs. Although Olshausen[1] adds confusion to this obscure subject by including simple *hydrops folliculi* in the same chapter with cystomata, he expressly states that the development of the latter from the former is rare. Cystic ovaries belong to the mixed type —*i. e.* the anatomical changes in them are not confined to the ovisacs, but involve the stroma as well; in fact, the latter stand in a direct causal relation to the former. It is safe to say that the boundary between the normal and the pathological is often extremely ill defined. According to a recent writer,[2] "there is no morbid condition which can be termed 'slight cystic degeneration.' Moderate enlargement of a few Graafian vesicles is not enough to constitute it, since this occurs in the fœtal ovary as a physiological process."[3] An apparent increase in the number of visible ovisacs is no evidence of an actual increase in the entire number as the result of disease; Virchow showed the absurdity of this idea forty years ago. Hydrops folliculi, on the contrary, as Sinéty and Melassez assert, results from destruction of the ovisac, and is associated with stromal disease. Nagel adopts this view, and believes with these writers that a dropsical vesicle "can never develop into a true cyst;" the corpus luteum is much more likely to form a cyst than is the Graafian body. It is evident that, from an anatomical standpoint, the diagnosis of "cystic degeneration" cannot properly be made except after a careful macroscopical and microscopical examination of the suspected ovary, but practically it is important for the surgeon to have some criterion by which to judge concerning the functional integrity of such a suspected organ.

Enlargement of the gland is a necessary result of this condition. The presence of half a dozen vesicles on the exterior of an ovary of normal size and consistence, with no other evidences of disease, certainly does not justify the use of the term "cystic" and the consequent extirpation of the gland. A typical specimen is enlarged to two or even three times its normal size, is more globular than usual, and of softer consistence. If there is a large central cyst, a distinct sense of fluctuation may be obtained on compressing the specimen between the thumb and finger. One or more cysts of considerable size projecting

[1] *Op. cit.* [2] Nagel: *Archiv für Gynäkologie,* Bd. iii. Hft. 3.
[3] Klebs: *Handbuch der Path. Anatomie,* p. 789.

above the surface of the organ may give to it an irregular knobbed appearance. As a rule, the enlargement is at the expense of a few cysts, one or two of which may reach the size of a marble or English walnut. Sometimes the ovary is divided into two distinct portions, one consisting of a single unilocular cyst, the other of the cirrhotic stroma from which all traces of ovisacs have disappeared. The cyst may continue to grow at the expense of the stromal remains, until the latter become indistinguishable and there exists an actual ovarian cyst having its origin in dropsy of a single peripheral follicle. Again, the dropsical ovisac may be imprisoned in the depths of the stroma in consequence of indurative changes in the latter, and may undergo gradual enlargement, the stroma being atrophied from pressure until only the cortical portion remains, forming the wall of a unilocular cyst; it is evident that the size of such a central cyst must be limited by reason of its environment, so that it can hardly exceed that of an English walnut, and would never be regarded as a tumor.

FIG. 299.



Moderate Cystic Enlargement of the Peripheral Follicles (Leopold).

Examining a cystic ovary in detail, we note evidences of chronic oöphoritis in the shape of localized thickening of the albuginea (which may be due to peri-oöphoritis), especially in the immediate vicinity of the dilated ovisacs; if the tissue covering a cyst is thickened, further enlargement of the latter cannot occur toward the periphery, so that it may project only slightly above the surface, although it is of considerable size. Not more than one-third of a cyst usually projects, so that it is really larger than it appears on inspection. The cysts vary in color according to the character of their contents and the thickness of their walls. If the latter is thin and transparent and the fluid is serous, they appear of a light-gray or yellowish-color; hemorrhage into a cyst or retrograde changes in its wall give the fluid a brownish tinge or render

it white and turbid. If the wall over the projecting portion of the cyst becomes much thinned, it presents the same appearance as a normal ovisac when on the point of rupturing, a fine network of vessels being seen; indeed, normal and dropsical follicles may be present side by side, and may rupture at or near the same time, the cyst simply collapsing and forming a large cicatrix, while a corpus luteum forms in the ovisac and undergoes the usual changes. Such small, thin-walled cysts are seldom an accompaniment or result of chronic oöphoritis, but, as Olshausen[1] observes, "the stroma of the ovary is intact, and the majority of the follicles are in a normal condition."

In direct contrast to these minor degrees of cystic dilatation is the rare condition in which the majority of the ovisacs undergo marked enlargement, so encroaching upon the stroma that it disappears entirely, adjacent cysts being separated from one another by thin septa of connective tissue. The individual cysts seldom exceed a pigeon's egg in size, but the ovary may be as large as the fœtal head at term. Both ovaries are affected. Comparing these ovarian tumors with specimens of moderate cystic degeneration, we must agree with Olshausen that "these are merely differences of degree, and do not support Tait's view that the tumors form a special variety." "It is a question, however," adds the same writer, "whether these cases should not be included among the proliferating cystomata, or whether they do not represent a transition to the latter." The study of these tumors is interesting from its bearing upon the mode of development of true unilocular ovarian cysts, but it does not concern us here.

A careful inspection of the cut surface of a cystic ovary (the section being made in the plane of its longest diameter) will furnish a clear idea not only of the nature and distribution of the cysts, but of their mode of origin. When the interior of the ovary is exposed, numbers of deeper cysts will be seen, the presence of which was not suspected. These are scattered about in the stroma, each one being surrounded by a ring of indurated tissue, while at the same time its proper wall is distinctly thickened. This is most marked in the case of the peripheral cysts, which are covered by the thickened albuginea; in fact, the presence of this general cortical thickening is an important factor in their etiology, as will appear later. As before mentioned, the ovary may be transformed into a single large central cyst surrounded by a narrow ring of stroma; like nearly all the others, such cysts contain a clear serous fluid and are lined by a smooth, glistening membrane.

The stroma of a cystic ovary shows the hyperplastic and cirrhotic changes already described, but these are usually localized; in some places it may present a normal appearance or it may be the seat of hyperæmia. Hemorrhage into pre-existing cysts is not common,

[1] *Op. cit.*

though the latter may originate from follicular apoplexy. Colloid patches are most frequent in the immediate neighborhood of the deeper cysts. The question naturally suggests itself: Given two ovaries which macroscopically appear to be nearly identical, why do the Graafian vesicles show a general tendency to enlargement in one and not in the other? We are not in a position to affirm what is the true cause of the dropsy; there may be disease of the affected ovisac, but Peaslee's theory, that it is the result of a catarrhal process, is too simple to explain it satisfactorily. Moreover, it would not account for the simultaneous enlargement of so many vesicles, the different degrees of dilatation, and the fact that the peripheral ovisacs are most often affected. In simple cystic dilatation, unaccompanied by disease of the stroma, Olshausen suggests that recurring menstrual congestions, while they cause an increase in the amount of liquor folliculi, may not be sufficiently acute to produce rupture; hence the gradual dilatation of the vesicle (which in these cases is of course situated at the periphery) until it ruptures in consequence of increased pressure. In direct contrast with this mode of origin is that in which follicular apoplexy results from excessive congestion, as described in the section on Hyperæmia. True cystic disease is clearly a result of stromal changes referable to chronic oöphoritis which not only induce a state of hyperæmia, that causes a progressive dilatation of the vesicle as above described, but also prevent the cyst from rupturing. The failure of the deeper cysts to reach the surface and discharge their contents or to rupture *in situ* is to be ascribed not only to the thickening of their walls, but, above all, to the induration of the surrounding stroma. Where the entire stroma is transformed into firm fibrous tissue the cyst cannot enlarge, and often atrophies and disappears; hence the comparative absence of cysts in large fibroid ovaries.

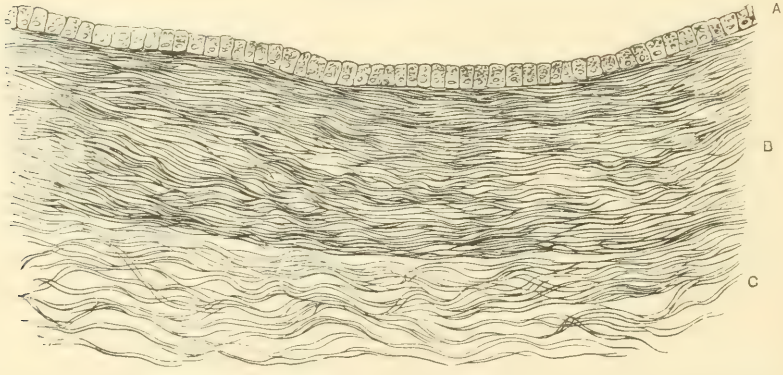
Fibrous hyperplasia must be localized in order to be associated with extensive cystic degeneration. Cysts situated beneath the albuginea, which has been thickened in consequence of chronic inflammation (whether in the ovary or in the surrounding peritoneum, or in both), are prevented from rupturing for a similar reason, although their walls being more elastic they are usually able to dilate more than those situated in the midst of the indurated stroma.

From what has been said, it is clear that so-called "cystic degeneration" is not a distinct variety of ovarian disease, but is merely a result of the changes already described as due to chronic oöphoritis. Follicular dropsy, cirrhosis, and hyperplasia are commonly met with in the same specimen; in one the interstitial changes may be most marked, in another the follicular. The ovary is designated according to the predominating character of the anatomical change, but, while general cirrhosis or fibrous hyperplasia may be unaccompanied by marked follic-

ular changes, true cystic degeneration does not exist without evidences of at least localized disease of the stroma.

Minute Anatomy.—A microscopical examination of sections of an apparently normal ovary frequently reveals unsuspected morbid conditions which, though localized, show that the integrity of the gland has been impaired. But it by no means follows that these changes are all due to inflammatory processes. Degeneration and atrophy of the ovisacs and localized induration of the stroma occur in specimens which can hardly be regarded as actually pathological in character. The fact that experienced observers not only see different objects in similar sections, but interpret identical appearances differently, shows the intrinsic difficulties of the study of ovarian pathology. That the subject has not been exhausted must be inferred from the descriptions of newly-discovered morbid processes which appear from time to time. It is not desirable in a practical article to enter into a discussion of the disputed points in the pathological histology of the ovary, since these possess little interest for the general reader. The subject of incipient cyst-formation alone would furnish material for a monograph. In describing the microscopical appearances seen in a specimen of chronic oöphoritis we shall have particular reference to the cystic type, since this is most frequently met with and combines in one or a few sections a number of morbid processes. The subject will be simplified by studying first the follicular, and then the stromal, changes.

FIG. 300.



Section of the Wall of a Simple Cyst (Olshausen): A, epithelial lining; B, inner fibrous layer; C, outer fibrous layer.

A section of a simple cyst, such as has been described, shows that its wall is composed of two fairly distinct layers of fibrous tissue; on the inner rests a single layer of cylindrical epithelium. A ring of indurated stroma surrounding the cyst forms a third layer; if the cyst is peripheral, it will be covered by the albuginea, in which case (especially if the latter has been thickened in consequence of peri-oöphoritis) the

wall will not be of uniform thickness. Fatty degeneration and disintegration of the lining epithelium may be observed. It should not be forgotten that these same changes (degeneration of the epithelium and sclerosis of the cyst-wall) are seen in the ovaries of children without evidences of an inflammatory origin.[1] The vascular supply of the cyst is comparatively poor; the general course of the mural vessels is toward a point opposite the inner end of the ovary. In consequence of localized hyperæmia of the stroma surrounding the cyst its own vessels may be dilated. The contents of the cyst is a serous fluid of low specific gravity, containing sodium chloride and a trace of albumen. The larger cysts contain a few epithelial cells and blood-corpuscles, if hemorrhage has occurred, occasionally a little pigment and cholesterin; in the fluid from the smaller dropsical follicles (even those as large as a marble) will be found cells of the membrana granulosa and the ovum, the latter being granular and indistinct and wanting its germinal vesicle. Whether the cells of the membrana granulosa become transformed as the cyst grows larger, or not, is a disputed point; the fate of the ovum when the cyst reaches the size of a walnut is also uncertain.

It is of importance to study the retrograde changes in dilated follicles, since these have been held responsible for the development of true cystomata. We have seen that a superficial cyst may rupture and its walls may simply collapse and atrophy, leaving a small depression or cicatrix, but that central cysts surrounded by indurated stroma cannot discharge their contents in this way. It is probable that some of the latter atrophy in consequence of contraction of the cirrhotic stroma; at least that is the impression given by a microscopical examination of the small pits or cavities in the interior of fibroid ovaries; the fluid may be absorbed and the walls may be brought in contact by continued pressure. Moreover, the vascular supply of the cyst may be cut off by compression of the vessels, as well as in consequence of changes in the vessel-walls. The so-called *corpora fibrosa* described by Patenko[2] as sharply-

Fig. 301.

Fig. 302.

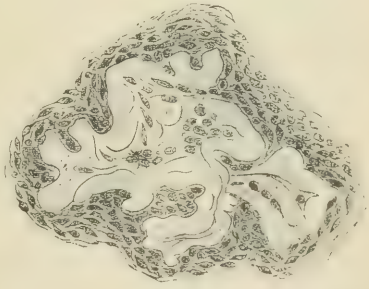


Fig. 301.—Longitudinal Section of an Ovary, showing corpora fibrosa (Patenko): *a*, large corpus fibrosum; *b*, *b*, smaller ones.

Fig. 302.—Section of a Small Corpus Fibrosum in a medium-sized follicle, showing sclerosis confined to the membrana propria (Patenko).

[1] Slavjansky: *Virchow's Archiv*, Bd. li. p. 470.

[2] *Virchow's Archiv*, Bd. lxxxiv. p. 193.

defined masses of firm fibrous tissue entirely distinct from the surrounding stroma may result from the granular and colloid metamorphosis of dropsical, as well as of undilated, follicles. As the follicle degenerates its thickened wall shrinks and forms folds, which are penetrated by ingrowths from the stroma. The walls of the blood-vessels surrounding the affected follicles undergo indurative changes which involve both the media and the adventitia, while the stroma is infiltrated with leucocytes, showing that the process is to some extent of an inflammatory character. Corpora fibrosa when once formed do not grow any larger, but adjacent ones may coalesce, so that, if the follicles are generally affected, the entire ovary may be transformed into a fibrous tumor as large as a hen's egg. This condition may closely resemble that already described as fibrous hyperplasia, but the latter is due to stromal, the former to follicular, changes.

It must not be forgotten that in a cystic ovary we may meet with involution and atrophy of follicles which have never exceeded their normal size; disease of the stroma will usually be noted in their immediate vicinity, although the change in the follicles does not appear to be of inflammatory origin. We cannot discuss the relation of these degenerative processes to cyst-formation. Harris and Doran[1] have suggested that cysts may be formed by "a process of abnormal involution of Graafian follicles, in which there is an active ingrowth from the surrounding stroma and a long persistence of certain remains of the membrana propria"—a view to which Gabbett[2] takes exception. Various writers—more recently Coblenz[3]—have described hyaline or colloid degeneration of the follicles.

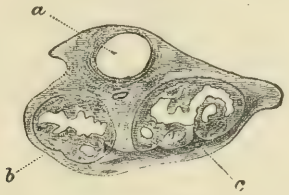
From a minute examination of the follicles in an ovary which is the seat of chronic disease, it is clear that the morbid processes are mainly degenerative, rather than inflammatory, and are directly due to changes in the stroma. The latter are often quite complex; different sections of the same ovary may present an entirely different appearance. In one spot the tissue may be firm, non-vascular, almost cicatricial, while in another it is soft, œdematous, and hyperæmic; in one section the stroma may present a fairly normal appearance, while in another it is entirely transformed into firm connective tissue. True cicatricial tissue, as Ziegler[4] has shown, is seldom found in the ovary. In the neighborhood of the dropsical follicles the cirrhotic change is usually quite marked, but in the albuginea it is especially prominent. In that part of the stroma which has not undergone fibrous hyperplasia or atrophy the blood-vessels are often generally dilated, and there may be punctate hemorrhages and collections of blood-pigment;

[1] *Journal of Anatomy and Physiology*, 1880, 50, p. 453. [2] *Ibid.*, 1881, 16, p. 192.
[3] Abstract of article in *London Med. Record*, 1882, p. 81.
[4] *Path. Anatomie*, 1885, p. 1483.

interstitial groups of leucocytes are sometimes observed, marking the presence of subacute inflammation. A condition recently described by Gottschalk[1] under the term "cavernous degeneration" of the ovary, in which the stroma presented a general angiomatous appearance, was doubtless one of general ectasis of the vessels in consequence of chronic disease.

Colloid transformation of the stroma has attracted considerable attention in view of its possible relation to cyst-formation. The con-

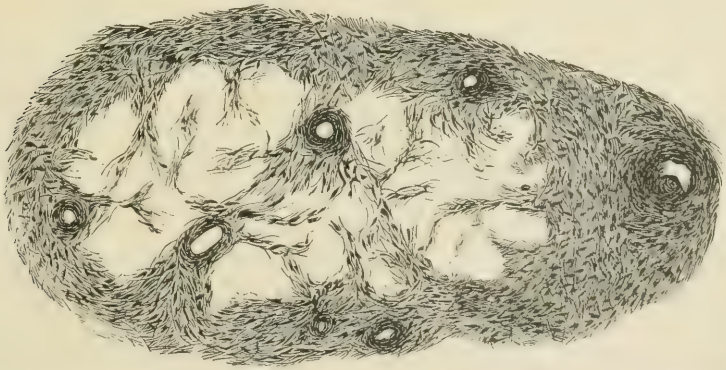
FIG. 303.



Section of Ovary, showing mucoid masses (Doran): *a*, normal follicle; *b*, *c*, follicles which have undergone abnormal involution, containing gelatinous material (magnified by pocket-lens).

dition is similar to the "geodes" in fibrous tumors, and suggests a like origin (from lymphangiectasis). Irregular cavities, without distinct cellular lining, exist in the midst of the stroma, filled with a translucent hyaline material; ingrowths or trabeculæ from the stroma cross the cavities, as well as blood-vessels, which may rupture and give rise to hemorrhage. They are often associated with hyperæmia and follicular hemorrhages, but there is no evidence, according to Gabbett,

FIG. 304.



Section of a Degenerated Follicle, containing myxomatous material (Doran), showing ingrowths of the stroma (two-inch objective).

that they are of inflammatory origin. These spaces grow by union with each other, and the stroma around them becomes indurated so as to form a sort of wall, but there is no evidence that they ever develop

[1] *Archiv für Gynäkologie*, Bd. xxxii Heft 2.

into cystomata. As the blood-vessels in the vicinity of the colloid spots show marked diminution of their lumina, it is suggested that this may be simply another form of degeneration consequent upon imperfect nutrition of the diseased ovary.

The vascular changes in connection with chronic oöphoritis are not without interest. In the less diseased portions of the stroma the arteries may be dilated and tortuous, but in the region of the fibrous hyperplasia the inner and middle coats may be so much hypertrophied that the lumen is nearly obliterated. The middle coat is much thickened by a deposit of material which resembles amyloid. Noeggerath has suggested the possible origin of some ovarian cysts from such diseased vessels. As Gabbett[1] aptly concludes: "The question of the origin of cysts is one of such consequence in ovarian pathology that there is a natural tendency to assign to all morbid appearance an importance as being somehow connected with cyst-development." Allusion has already been made to the direct relation between a diminished blood-supply and the various degenerative changes observed under the microscope. The diseased condition of the intra-ovarian vessels explains this in part; doubtless the obstruction to the circulation outside of the ovary caused by the pressure of peritoneal adhesions is sometimes a potent factor.

Tuberculous Oöphoritis.

Tuberculosis of the ovaries is usually treated in chapters on solid tumors, but there seems to be no reason to describe tubercle as a neoplasm, since when it occurs in the tube it is regarded as a form of specific inflammation.

Tuberculosis of the ovary is certainly rare, especially the gray miliary nodules; the latter develop in cases of general tuberculosis, being a local expression of the general infection. Klebs states that it is never associated with tuberculous inflammation of the uterine and tubal mucosa; which is clearly an error, since in 56 cases of tuberculosis of the pelvic organs collected by Mosler and Talamon the ovaries were found to be the seat of tubercle in 12. It is natural to infer that the infection might be transmitted directly through the tubes as well as through the medium of the blood.

A tuberculous ovary is usually somewhat enlarged, is of soft consistence, and on section presents cheesy foci varying in size from a millet-seed to a marble. By the softening of such nodules collections of semi-fluid material result, which might escape into the cavity through rupture of the sac, causing fatal peritonitis. Peri-oöphoritis is a usual accompaniment of this condition.

The diagnosis of ovarian tuberculosis is more a matter of scientific

[1] *Loc. cit.*

than of practical interest. As the development of the disease is always secondary to general tuberculosis, its presence may be inferred in cases of this character in which progressive enlargement of the ovaries can be detected. The diagnosis of tuberculous salpingitis, however, is much more probable under these circumstances, as the tubes are so much more frequently affected.

Laparotomy will of course not be undertaken with the express purpose of removing affected ovaries and tubes in cases of general tuberculosis. The question of operative interference in tuberculous oöphoritis and in tuberculous salpingitis is somewhat different, since in the latter case the disease may originate in the tubes and may be confined to them, thus furnishing the ordinary surgical argument for extirpation—the possible avoidance of general infection. Winckel does not believe "that salpingotomy for tubal tuberculosis has a very promising future."

Prolapse of the Ovary.

The displacements of the ovary considered in this connection are at once the cause and the result of disease. A previously healthy organ when carried downward with a retroverted uterus has its circulation more or less obstructed, and becomes the seat of the chronic changes already described; this is especially likely to occur if it is buried in adhesions. On the other hand, an ovary enlarged in consequence of fibroid hyperplasia or cystic degeneration tends, other conditions being favorable, to sink below its normal plane.

Etiology.—Descent of the ovary independent of the uterus may be due purely to increase in the weight of the gland. This has been proved beyond doubt by cases in which temporary prolapse has followed the moderate enlargement attending menstruation or attacks of acute inflammation, the ovary returning to its normal position after it has regained its former size.

Prolonged hyperæmia from sexual irritation is regarded by Goodell as a common cause of enlargement and descent: for the same reason chronic oöphoritis is a direct causal factor. Certain conditions favor this displacement; thus, during pregnancy, through the elongation of the ovarian ligaments, the ovaries are carried far above their usual level, while at the same time they become considerably enlarged. If for any reason involution is retarded, the heavy glands, being less restrained in their movements (in consequence also of the relaxation of the broad ligaments during pregnancy), tend to sink downward.

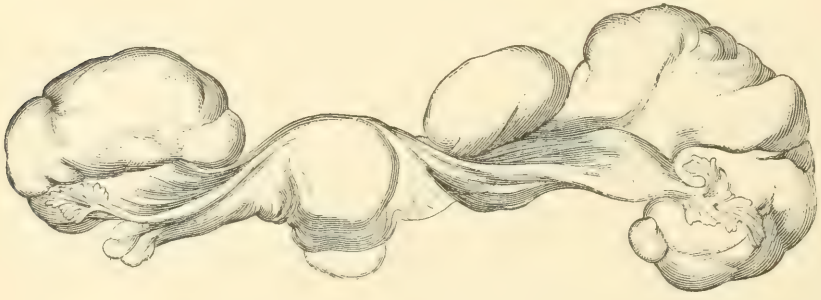
Acute prolapse of the healthy ovary from blows or falls probably does not occur, or if it does it is extremely rare; in cases in which this accident has been supposed to take place there was doubtless really a

recurrence of a former displacement. Increased abdominal pressure alone could hardly cause prolapse of the normal ovary, unaccompanied by displacement of the uterus. Pressure from an over-distended bladder or morbid growth may displace an ovary downward, but this is not a true descensus. Perimetric adhesions in the broad ligaments may draw the organ from its proper position, but it is a question how far actual prolapse is due to traction alone. In every case in which a displaced ovary is found buried in adhesions there is doubt as to whether the displacement preceded or followed the peri-oöphoritis. The history of the patient and the results of previous examinations must settle this point.

In general, we may infer that the inflammatory process was secondary. The frequent association of acquired anteflexion and prolapse of one or both ovaries is an interesting fact that has never been satisfactorily explained. It is difficult to see how the uterine displacement can be a direct cause, and the posterior parametritis that produces the anteflexion is seldom sufficiently extensive to draw the ovary into Douglas' pouch.

Anatomy.—In descensus of the ovary alone the organ (usually the left) sinks downward and backward, and at the same time describes an arc toward the median line, of which the Fallopian tube and ovarian ligament form the chord; the effect of this movement is to bring the ovary behind the uterus, unless the latter remains in its normal position (Barnes). The left ovary is most frequently displaced, as it is more liable to enlargement from disease for the reasons already mentioned.

Fig. 305.



Prolapse of the Ovaries with Fixation (Olshausen).

The ovary in its downward descent reaches the portion of the posterior pelvic fossa just above the level of the sacro-uterine ligaments known as the "retro-ovarian shelf," where it may remain. As this space on the left side is encroached upon by the rectum, the corresponding ovary tends to slip downward still farther into the cul-de-sac of Douglas; hence the explanation of the well-known clinical fact that when both

ovaries are prolapsed the left lies at a lower level and is more accessible to the examining finger. For this reason it may appear to be more enlarged than the right, when the reverse is really the case. As has been said, it may usually be inferred that when an enlarged ovary is found at the bottom of Douglas' pouch it is the seat of chronic oöphoritis, which existed before the displacement took place, and is aggravated by the abnormal position of the organ and the interruption to its circulation, especially at the time of menstruation. If it is freely movable and is not extensively diseased, it may be confidently expected that it will diminish in size and weight if it can be elevated to such a level that the strain will be taken from its vessels and its supporting ligaments recover their tone. It is evident that even a perfectly healthy ovary when lying in the posterior cul-de-sac is placed under the most favorable conditions (congestion, mechanical injury, etc.) for the development of subacute inflammation, which in its turn is attended with peri-oöphoritis and consequent fixing of the gland in its abnormal position. Thus the morbid change in the ovary is retroactive, as it were, giving rise to conditions which in themselves increase the original trouble.

The association of tubal disease with the ovarian displacement has not been considered, as this subject belongs under another head; the combination is a very common one, and the accompanying peritonitic exudation is much more extensive than when the ovary alone is affected. When the latter is completely buried in adhesions, as is usually the condition in cases of pyosalpinx, it is not only liable to attacks of acute inflammation, but often becomes completely atrophied, so that it is difficult to discover it even at the post-mortem examination.

The mode of descent and the ultimate position of the ovaries in cases of retro-displacement of the uterus do not especially concern us, except that here it is important to note that the prolapse of the ovaries, being due to mechanical traction, usually precedes chronic oöphoritis; however, in cases of subinvolution of the uterus the ovaries share in the general pelvic congestion and become enlarged and heavier. Since the uterus is the first to sink downward, the ovaries in descending execute a movement nearly the reverse of that before described, so as to lie somewhat in front of the former. When fixed by adhesions, however, they are more often found just external to, or even beneath, the fundus of the retroflexed uterus; they are then subject to the same morbid influences as were described before.

Symptoms.—In order to avoid repetition the reader is referred to the section on the symptomatology of chronic oöphoritis. Prolapse of the ovary, not being a disease in itself, can hardly be said to give rise to any separate set of symptoms. Such as arise are explicable on purely mechanical grounds, and are such as would be expected from the

anatomical relations of the displaced ovary. Thus, the passage of hardened feces through the rectum is accompanied by darting pains in the adjacent ovary, which may persist for some time after the act, accompanied by nausea and sometimes various reflex pains in distant parts of the body. Vesical and rectal tenesmus, sexual excitement, and other phenomena may be present. Dyspareunia is a common symptom, coitus giving rise to paroxysms of pain, though less severe than those attending defecation. Locomotion is attended with pains in the groin and sacrum extending down the thigh. Dysmenorrhœa is of course marked. In short, the symptoms are such as belong to chronic disease of the ovary, *plus* those arising from its abnormal and exposed position.

Diagnosis.—This is readily made according to the ordinary rules of gynecological examination, provided the ovary is completely prolapsed, and especially if it is enlarged. On the other hand, if it is small and occupies the retro-ovarian shelf, instead of the bottom of Douglas' pouch, and the vagina is unusually long, the most experienced examiner, although he may suspect the presence of the displaced ovary from the peculiar pain described by the patient when firm pressure is made against the posterior fornix, cannot map it out satisfactorily. Much may be learned by touching the patient when in the left lateral position; the perineum can then be pushed upward by the knuckle, so that the tip of the index finger can reach and explore the deepest fornix.

While the question of differential diagnosis is treated elsewhere, brief mention should be made of a few small tumors in this region which may be mistaken for prolapsed ovaries. The fundus uteri can hardly be confounded with an ovary by any one who uses ordinary care; the passage of the probe ought to settle the diagnosis. A small pedunculated subperitoneal fibroid is hard, painless, and moves with the uterus when that organ is not fixed. Indurations in the peri-uterine tissues, the result of former inflammatory processes, are less circumscribed in shape than ovaries, are not so sensitive, and the pain produced by firm pressure upon them is rather of a dull aching character than sharp and sickening. Such indurations are most commonly situated at the bases of the broad ligaments; prolapsed ovaries are seldom found exactly in the lateral pouches.

Isolated masses of hardened fecal matter are sometimes mistaken for small displaced ovaries—an error which is avoided by noting the location, mobility, softness, and comparative insensitiveness of scybala.

Enlargements of the tube are often mistaken for those of the ovary; when both tube and ovary are diseased and are fused together by exudation, refinements in diagnosis become practically impossible and one must be guided by the previous history of the case. Under favorable

circumstances it is possible to tell by the vaginal touch whether cystic degeneration or fibrous hyperplasia is the existing condition in the displaced gland, but more often the examiner can only say that it is larger than normal. Laparotomists constantly find that the sensation of size conveyed by the touch is deceptive. Prolapsed ovaries are, as a rule, larger than they appear to be, since only a small portion of their surface is accessible to the finger-tip.

The question of the mobility of a prolapsed ovary is one of no small importance to the patient. This is determined by making firm pressure upon the organ and noting whether it can be lifted above the level at which it is apparently fixed; the reader must not mistake elevation of the pelvic contents *en masse* for actual lifting of the ovary.

Peri-oöphoritis explains the extreme pain and tenderness which are present in cases of fixation of the ovary. The increased pain at the time of menstruation is not necessarily indicative of recurrent attacks of localized peritonitis; the ovary, surrounded and compressed by dense adhesions, is unable to enlarge, as it does normally from the increased afflux of blood, and the ovisacs cannot burst through the thickened cortex. With regard to the inclusion of nerves, whether extra- or intra-ovarian, within the indurated or cicatricial tissue, we are entirely in the dark.

Prognosis.—If the displacement of the ovaries depends upon retroversion of the uterus, by replacing the latter organ and keeping it in position by means of a suitable pessary they may usually be lifted out of harm's way. But if they are fixed, while the uterus is movable, by restoring the latter to a position of anteversion so much traction is exerted upon the imprisoned glands that the pain thus occasioned may be worse than before. In cases of primary displacement of the ovaries the prognosis is good as regards relief of the distressing symptoms, so long as they are freely movable and show no evidences of extensive disease. Whether there will ever be a perfect cure, in the sense that the organs can be permanently retained at or near their normal level in the pelvis, is doubtful. It will depend upon whether or not they diminish in weight and their ligaments recover their lost tone.

The prognosis in a case in which the ovary is fixed by perimetric adhesions, is very tender to the touch, and is the site of the pains above described (both at and between the menstrual periods) should be extremely guarded. Two questions are involved—the cure of ovarian disease and the cure of the displacement. The latter depends upon purely mechanical principles. While there are cases in the practice of every gynecologist in which persistent treatment with resolvents and tampons has apparently caused the softening or disappearance of peri-oöphoritic adhesions, accompanied by diminution in the size and tenderness of the affected ovary and the restoration of some degree of

mobility, palliative treatment often proves to be unavailing and surgical interference offers the only positive means of relief.

Treatment.—The treatment of chronic oöphoritis has been described elsewhere, so that we shall consider here more especially the treatment of the displacement. A diseased and prolapsed ovary, as well as the peri-oöphoritis associated with it, is most favorably situated for local treatment, while at the same time we are able to recognize and eliminate certain harmful influences, as we cannot do if the organ has not descended. It must be confessed that the non-surgical treatment of this condition is at present far from being satisfactory, but we can at least promise the patient relief from her most distressing symptoms, even if we cannot conscientiously promise a cure.

Certain hygienic measures naturally suggest themselves in all cases. Disturbances of a mechanical character should be excluded. Since defecation causes not only extreme pain, but actual injury to the tender and inflamed ovary, the bowels should be carefully regulated, so that the evacuations may be semi-fluid. This does not mean that the patient should at one time have a diarrhœa and at another a discharge of small scybala (which latter cause more irritation than a copious evacuation of formed feces), but that the large intestine should be thoroughly emptied at the outset by means of large enemata of soapsuds and ox-gall, and afterward kept empty. By administering daily mild laxatives, such as cascara, salines, or aperient waters, this result can be obtained; but if the patient relies entirely on enemata, assisted by occasional doses of some vigorous purgative, the rectum will continue to be filled with scybala in spite of the daily evacuations. Unless the attendant takes the trouble to assure himself that the bowels are properly moved, he will find that his most carefully-conducted local treatment yields unaccountably poor results.

Dyspareunia, a symptom rarely absent in these cases, at once suggests a source of irritation which may undo all the results of treatment. The difficulty of properly regulating, not to speak of absolutely interdicting, sexual intercourse is almost insurmountable, especially in women of the lower classes. The gratifying results observed in the case of women with ovarian trouble from the higher walks of life, after a stay of a few months in a private hospital, are due quite as much to the suspension of their marital relations as to the local treatment which they have received; this may appear to be a strong statement, but it is borne out by the facts. In the case of the average dispensary patient the pelvic organs probably rarely enjoy physiological rest, except when she is in a hospital or otherwise necessarily isolated. It is perhaps the wisest plan to secure the co-operation of the patient's husband, and to explain to him the necessity of exercising due restraint. If the performance of the sexual act is attended with severe local and reflex pains and general

nervous disturbances, and local tenderness persists for some time afterward, he must be told plainly that no improvement can be expected unless he refrains entirely.

Rest in the recumbent posture during the day should be insisted on, especially at the time of the menstrual period. Unfortunately, such rest is not obtainable in the case of patients who are obliged to work in stores, factories, etc. But women who are engaged in housework can nearly always recline for an hour in the afternoon, and still longer during menstruation, or at least during the first day or two.

The hot vaginal douche is of course a valuable analgesic in this condition, whether it acts by modifying the entire pelvic circulation or by exercising a direct vaso-constrictor action upon the extra- and intra-ovarian vessels. Certainly, no one at the present day is prepared to dispute the practical results, as regards the relief of local pain and tenderness, when this agent is properly employed; but, as Dr. Emmet has so often said, injections of hot water are seldom administered in a manner to do the slightest good, simply from the neglect of a few simple details. There is no class of cases in which the benefit from this agent is more apparent than in those now under consideration. However, it can only be thoroughly tested in hospitals; there its effects are unquestioned. It should be stated that every patient with a tender prolapsed ovary cannot endure copious hot injections, but may be made worse by them; they are not to be ordered indiscriminately, but should be used carefully at first, and their results should be watched.

In considering the more direct treatment of prolapse of the ovary we naturally divide all cases into two classes, between which there is a wide difference as regards treatment, as well as prognosis. A prolapsed ovary may be either movable or fixed; if movable, the indication is to raise it up out of harm's way and to support it by a suitable instrument; if fixed, to loosen its adhesions and eventually to elevate it as before, or, this failing, to render the patient's lot as endurable as possible. The other alternative in the latter condition is surgical interference, to which the gynecologist may resort sooner or later according to his tendencies and experience.

In a simple case of recent retroflexion of the uterus, with accompanying dislocation of the ovaries, by replacing the former organ the ovaries are often carried so far upward that a lever pessary may be introduced and worn with perfect comfort. The tissues may so far regain their tone that the organs do not descend again after its removal, or at least not so low as before. In many cases, however, the pessary, if it is long enough and has a sufficiently large cross-bar to distend the posterior fornix and keep the uterus in position, presses directly upon the ovaries, and causes so much pain that it must soon be removed. If only one ovary is enlarged and tender, this may some-

times be avoided by making a depression in the upper end of the instrument opposite to the affected gland. When the ovaries alone are displaced, a pessary is used for the sole purpose of elevating them, which can only be done by exerting direct pressure on them. Bulb-pessaries may accomplish this, and may be tolerated for a time, but in order to prevent the ovaries from slipping down behind the bulb the latter must extend up so high as to make intolerable pressure on the rectum or the sacral nerves. Various substitutes for the bulb have been devised: the cross-bar is padded with cotton or it is constructed of soft rubber, but, while the firm surface presented by the hard-rubber bulb is thus avoided, the pessary is rendered so soft and yielding that its actual supporting power is greatly diminished and the ovaries are not sufficiently elevated. More recently bulb-pessaries of wire covered with soft rubber have been used with advantage in these cases. They usually afford only temporary benefit for the reasons given; added to this is the disadvantage that they must be removed at frequent intervals because of their tendency to cause an irritating vaginal discharge. It is only in exceptional cases that a patient can endure for a month or two the pressure of such a pessary upon a prolapsed ovary; still, by alternating between the use of the instrument and the vaginal tampon she may be made quite comfortable, if not permanently cured.

Fig. 306.

Mundé's Pessary for Prolapsed Ovary.

Among other expedients for temporarily replacing the dislocated ovaries should be mentioned Campbell's method, in which the patient assumes the exaggerated knee-chest position, so that gravity and pneumatic pressure through the vagina shall cause the uterus and its appendages to fall forward. The habitual practice of this manœuvre, followed by a period of prolonged rest on the side, naturally tends to relieve the strain on the relaxed ligaments and to relieve congestion. A firm vaginal tampon may be advantageously applied while the patient is in the knee-chest position, since in this way the retention of the ovaries at the highest possible point is assured. Further reference to the use of the tampon in this connection is unnecessary. It is enough to say that it is a valuable temporary support, and if it can be used daily or every other day the patient is not only much relieved, but in time the ovaries may become less sensitive, so that they will tolerate a pessary. Unfortunately, even when they are easily replaceable, they are so sensitive that they will not endure the presence of a cotton tampon sufficiently

large and firm to raise them considerably above their usual abnormal position.

With regard to the operative treatment of non-adherent dislocated ovaries we must be governed by the patient's wishes, as well as by the results of a careful and sufficiently extended course of palliative treatment. The indications for removal of the organs will be discussed elsewhere. Whether pain alone is sufficient to justify it is a question that every operator must settle for himself. There are undoubtedly some cases in which it seems to offer the only prospect of relief from this pain. Winckel echoes the sentiments of the more conservative gynecologists when he says, "The ovary should be extirpated only when it is diseased." This rule is undoubtedly a sound one, but it is not easy to follow it in these cases, because we cannot always determine clinically to what extent a prolapsed ovary is the seat of organic disease. Moreover, it may be questioned if such an ovary is ever perfectly healthy; the fact that it is prolapsed and tender presupposes conditions under which it could not long retain its functional integrity.

If the surgeon shrinks from extirpating a displaced ovary, he may resort to a less radical procedure—oöphorraphy. This ingenious (but not very practical operation) consists in shortening the relaxed infundibulo-pelvic ligament by "taking a reef" in it and stitching it to the hilum of the ovary, with the idea of keeping the latter in its normal position. But the causes that led to the displacement are still present, and there is little hope that the ovary will remain in place, especially if it has been so long prolapsed that it has undergone marked organic changes. It seems most applicable to cases of acute or recent prolapse, in which, however, there is always a good prospect of relief from palliative measures.

Operations which permanently correct retroflexion of the uterus (shortening of the round ligaments, hysterorrhaphy) of course afford more or less relief to patients whose ovaries are also prolapsed, since the glands rise up in the pelvis as the uterus is elevated, and may not sink downward again. Hysterorrhaphy offers the additional advantage that the ovaries can be removed at the time of the operation if it is judged expedient. On the other hand, cases are on record in which, after the performance of the Alexander-Adams operation, it became necessary to perform oöphorectomy because the ovarian trouble associated with the uterine displacement was not relieved.

The mechanical treatment of prolapse with fixation of the ovary demands an infinite amount of patience on the part of both physician and patient. The latter should be told plainly at the beginning that any improvement in her condition will be slow, and may not be observed by herself until months have elapsed, and that an act of imprudence on her part may undo the results of weeks of treatment. The

object of the latter is twofold—to relieve the actual inflammation in and around the displaced organ, and to dislodge it, if possible, from its abnormal position. To the former description of the treatment of chronic oöphoritis and peri-oöphoritis we have nothing to add here, except to say that the hygienic measures, hot douches, etc., before mentioned are especially applicable to the cases under consideration, as well as the usual applications (iodine, glycerin, and boroglyceride tampons) to the posterior fornix. Graduated pressure by means of cotton tampons is the agent upon which the gynecologist most relies in order to relieve the congestion of the ovary and to cause gradual absorption of the surrounding adhesions. Whether the tampon elevates the ovary alone or the entire pelvic contents, it is certain that it relieves pain and after its persistent use the organ apparently becomes more movable. The proper use of the tampon in this connection requires more judgment than is supposed by those who have never taken the trouble to distinguish between its various functions. Many patients can only bear one or two tampons at first, but subsequently they tolerate from six to eight, packed in firmly. It is unnecessary to enter into the details of this little operation.

Pelvic massage is useful where the ovary is less sensitive and there is no history of recurrent attacks of inflammation. As applied to these cases it consists in making steady upward pressure upon the gland with the tip of the index, or index and middle fingers, for one or two minutes, varied by occasional gentle rubbing or kneading movements, while the other hand makes counter-pressure upon the abdomen and draws the uterus forward. This manœuvre should be executed very carefully, and should be suspended as soon as it causes undue pain, or if it is followed by an increase in the local tenderness.

Electricity offers a valuable means of relieving pain. Galvanism is preferable; it should be applied two or three times a week for ten or fifteen minutes at a time, a current of from fifteen to twenty milliampères being sufficient. Its use requires no special knowledge. A large flat sponge, or a copper plate covered with a wet cloth, placed over the ovarian region is connected with the negative pole, while a ball electrode is introduced into the posterior fornix and is held in contact with the prolapsed ovary. The patient ought not to experience actual pain, but simply a warm, burning sensation. The sèance should be omitted two or three days before and after the menstrual period. (See also Vol. I., article on "Electricity in Gynecology.")

It may be that after such treatment has been conscientiously carried out for several months, or even years(?), the ovaries, although less tender than before, are still fixed at the bottom of Douglas' pouch. All evidences of subacute inflammation having ceased, and the presence of dangerous tubal disease being excluded, we may venture to attempt

forcible reposition by Schultze's method, which consists in etherizing the patient, placing her in the lithotomy position, and introducing the fore finger of one hand into the rectum, while the other hand grasps the fundus uteri above the symphysis and draws it forward. The rectal finger in contact with the imprisoned ovary seeks for an interspace between the gland and the surrounding adhesions, into which it is gradually bored until the latter become detached; the pressure is always made against the adhesions, not upon the ovary itself. The patient must be carefully guarded against subsequent peritonitis. Tampons or a pessary should be introduced to elevate the organ after it has been freed. This method is especially applicable to cases in which the uterus is also retroflexed and adherent. Statistics regarding the ultimate results of this operation are too few to allow of a judgment of its merits. It is evident that a recurrence of the displacement and a reformation of the adhesions are almost inevitable unless the patient can wear a pessary constantly, which is doubtful.

Among the palliative operations practised for the relief of this condition is laparotomy and subsequent ventro-fixation of the uterus—whether by hysterorrhaphy, shortening of the round ligaments, or retention of the uterus in a position of anteversion by means of a drainage-tube introduced to the bottom of Douglas' pouch. These operations, or rather modifications of the same operation, are alike in their essential details; the abdomen is opened, the uterus and its appendages are freed from their adhesions, and the former is permanently retained in its normal position, in the hope that not only it, but the tubes and ovaries also, will remain in their new plane. With regard to the accomplishment of the latter there is considerable doubt. Although they may not sink as low as before in the pelvis, it is highly probable that the ovaries will again become prolapsed and will contract new adhesions. Most operators will prefer to remove organs that have long been the seat of pain, and which in the majority of cases show evidences of advanced disease. When, as often happens, the tubes are also diseased, there is no doubt as to the proper course to pursue.

From what has been said it may be inferred that there is only one view to take of imprisonment of the displaced ovary—the pessimistic one. On the contrary, there are many of these cases in which palliative treatment has afforded so much relief that an operation, formerly proposed, is no longer to be thought of. It cannot be said that such patients are cured, since the affected organ remains *in situ*. But it is smaller and less tender than it was originally, dysmenorrhœa is less severe, and the patient with the exercise of constant care leads a fairly active and comfortable life, instead of being a half-invalid. This is not a cure, but it is infinitely better than her former condition, so that she is satisfied to try no additional experiments of a surgical character.

DISEASES OF THE FALLOPIAN TUBES.

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I. NEOPLASMS OF THE TUBES.

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"The structure of the uterine and tubal walls being similar," says Winckel, "all tumors which affect the uterus may be found in the tubes, affections of the uterine glands being excepted." "Neoplasms of the tubes," he adds, "are usually secondary, primary affections of this kind being extremely rare." Bearing in mind these elementary facts, it is evident that morbid growths as encountered in this locality present no special peculiarities, and that it is unnecessary for us to enter deeply into the question of their histogenesis.

Neoplasms of the tubes seldom reach a large size as compared with those of the uterus; moreover, it is sometimes difficult to decide whether a given enlargement is a true neoplasm or is simply the result of hypertrophy following inflammation, as in the case of chronic hyperplastic oöphoritis. This will appear in connection with so-called papilloma of the tube.

I. Benignant Growths.

a. Fibroma.—True fibromata are rare, and should be carefully distinguished from localized thickenings in the wall of the tube which result from inflammatory processes. The former originate from the fibro-muscular layer, and are usually intramural, less often subperitoneal, while the latter, as Hennig[1] pointed out, are essentially cicatrices situated in the submucous layer. Fibromata in the tubal wall seldom exceed a pea in size, although Simpson[2] is reported to have found one as large as a child's head. Klob[3] describes sessile and

[1] *Op. cit.*, p. 73.
[2] *Diseases of Women*, p. 541.
[3] *Path. Anat. der Weibl. Sexualorgane*, p. 292.

pedunculated fibrous bodies on the external surface of the tube. Histologically, they are identical with fibromata of the uterus, sometimes containing smooth muscle-fibres.

b. Lipoma.—Fatty tumors are extremely rare, and have not been observed larger than a walnut. Rokitansky[1] found one situated on the lower border of the tube just beneath the peritoneum.

c. Papilloma, Mucous Polypus.—It is doubtful if these ever occur as true neoplasms, similar to those in the endometrium; at least, those specimens which have been carefully examined have shown well-marked evidences of their origin by simple hypertrophy of the mucous membrane, the result of salpingitis.

d. Cysts.—From this category is of course excluded cystic enlargement of the tube itself (partial or general hydrosalpinx) and tubo-ovarian cyst. The bodies referred to are small vesicles, rarely larger than a hazelnut, and usually situated beneath—or, more properly, within—the peritoneal covering of the tube, where they present an appearance identical with that of the little cysts so often observed between the folds of the mesosalpinx. Hennig describes the hydatid of Morgagni under this head.

It is difficult to avoid the conclusion that many of the small vesicles frequently found in the mucous lining of the ampulla have a similar origin to the papillomata already referred to, since the absence of glands in this region forbids our regarding them as retention-cysts (like the Nabothian follicles, for example); in fact, Hennig speaks of the sago-like bodies found in the wall of dilated tubes. These cysts are sometimes pedunculated, and contain a clear serous fluid yielding mucin; under the microscope it shows degenerated epithelial cells, occasionally ciliated. Kiwisch mentions a form of cyst situated in the submucosa which, from his description, suggests the "geodes" found in uterine fibroids undergoing cystic degeneration—irregular spaces surrounded by a wall of fibrous tissue undergoing fatty degeneration. Similar cavities within the muscular layer seem to originate from interstitial extravasations of blood. Faye[2] describes an atheromatous cyst which he found in the distal end of a tube. Winckel[3] calls attention to the fact that the external cysts may by their rupture give rise to localized peritonitis; this seems rather improbable, considering the small size of these bodies and the innocuous nature of their contents.

II. Malignant Growths.

Medullary carcinoma is the form of malignant disease met with in this locality, and all authorities agree that it is always secondary.

[1] *Lehrbuch d. Path. Anat.*, vol. iii. p. 442. [2] *Norsk. Magaz.*, xv., 1861, 7, p. 593.
[3] *Op. cit.*, p. 501.

Scanzoni's[1] case of supposed primary carcinoma, if carefully studied, will hardly impress one as an exception. Kiwisch[2] affirms that he found the tube involved in upward of 24 per cent. of cases of carcinoma of the body of the uterus, while Wagner[3] notes only 5 per cent. According to my own observation, the tubes are far more likely to be secondarily involved in the malignant disease of the ovaries and peritoneum. As a rule, in cases of carcinoma of the corpus uteri the mucosa of the tubes simply shares in inflammation of the endometrium, as in ordinary cases of septic endometritis.

FIG. 307.

Carcinoma of the Tube and Ovary (Winckel).

As observed at the post-mortem table, cancerous tubes are so blended with the diseased ovaries and buried in adhesions that it is difficult to discover the original seat of the disease. The tube is usually the seat of general hypertrophy, and shows on its exterior in addition circumscribed nodules; similar nodules may be found on the mucous membrane or even imbedded in the muscular layer. In some instances the tube, like the ovary, is transformed into a cancerous mass, so that nearly all traces of its former shape disappear; the tumor may be as large as a child's head. Peri-salpingitis is an invariable accompaniment of this condition. In Dittrich's[4] case fatal peritonitis resulted from rupture of the cancerous tube.

Histologically, carcinoma of the tube presents no peculiarities requiring special mention. According to Hennig,[5] medullary cancer develops from the submucosa, as well as from the layer of tissue immediately beneath the peritoneum, and rapidly encroaches upon the intermediate fibro-muscular layer, the degeneration of which gives rise to irregular cavities.

Scirrhous cancer of the tube has been described by Rokitansky, but there is no authentic case of sarcoma on record. It is evident that the study of malignant disease in this region possesses no practical interest, since the question of surgical interference could hardly arise at that stage in the disease when the tube is involved.

[1] *Lehrbuch d. Krankh. d. Weibl. Sexualorgane*, p. 326.
[2] *Klin. Vortr.*, i. 484, and ii. 215.
[3] *Gebärmutterkrebs*, pp. 18–123.
[4] *Prager Vierteljahrschrift*, 1845, iii. p. 110.
[5] *Op. cit.*, p. 91.

Tuberculosis, being essentially an inflammatory process, is considered under the head of Salpingitis.

Sarcoma.—Saenger[1] reports a case of so-called "primary sarcoma" of the tubes, which he affirms is the only one on record. The ovaries were not affected, but metastatic deposits were found in Douglas' pouch. Considerable stress is laid by the writer upon the presence of numerous papillary projections on the mucous membrane, while the mucosa and submucosa were infiltrated with round cells, which also invaded the hypertrophied muscular coat. Both tubes were dilated and filled with a sero-sanguineous fluid. If the reader will compare this description with that of the changes produced by chronic catarrh of the tube, the resemblance will appear so striking that he must be rather incredulous as to the existence of malignant disease in this case, and especially a variety so unique in this region. The newly-formed glands described by the writer were very likely those gland-like depressions in the mucous membrane, lined with cylindrical epithelium, which are formed simply by the folding-in of the hypertrophied mucosa. Moreover, the dilated tubes were filled with a fluid such as would naturally be associated with a chronic inflammatory process. From the description of the specimen we are warranted in doubting the correctness of the diagnosis.

Symptoms and Diagnosis.—In the recorded cases of neoplasms of the tube the condition was, almost without exception, discovered at the post-mortem table. This may be inferred from the fact that the tumors are usually either so small as to escape recognition in the living subject, or, being secondary to disease of the uterus or ovaries, are completely masked by the latter.

Non-malignant growths of the tube give rise to no special symptoms; in fact, as has been stated, the enlargements of the tube formerly ascribed to fibroma or papilloma are the result of chronic salpingitis.

In the rather doubtful case described by Simpson, of a fibroma of the tube as large as a child's head, there was nothing by which to distinguish the growth clinically from a solid ovarian tumor or a small pedunculated subperitoneal fibroid. From the mobility of the tube a fibrous tumor developing from it, if sufficiently large, might press upon neighboring organs, or by becoming impacted in the pelvis might give rise to the same symptoms as a uterine or ovarian tumor in the same situation, so that the question of its removal would arise.

With regard to growths of a malignant nature the case is somewhat different. Dismissing tuberculous nodules, which have been recognized by the bimanual in cases of general tuberculosis, we occasionally meet with instances in which carcinoma of the ovaries is accompanied with secondary masses in the tubes, the latter being recognized as strings of

[1] *Centralblatt für Gynäkologie*, 37, 1886.

nodules extending outward from the uterus. But here too the pelvic organs are generally so fused together by the accompanying peritonitis that exact localization of the disease is impossible. When the corpus uteri is primarily affected by malignant disease, the tubes are more likely to become the seat of inflammatory trouble before becoming cancerous, when the symptoms would be those of salpingitis.

In general, as has been stated, neoplasms in this region possess a purely pathological interest, since when they become the seat of growths of sufficient size to be recognized (or, rather, suspected), the uterus and ovaries are already so extensively involved, and all the pelvic organs are so matted together by peritonitis, that operative interference is out of the question.

Hyperæmia of the Tubes.

The line of separation between normal and pathological congestion of the tube is so ill defined that it is impossible to state when one passes into the other. The tube has no independent blood-supply; it is simply a continuation of the uterus, and shares in inflammation of the endometrium. Moreover, since it is supplied by branches of the ovarian artery, it is directly affected by any obstruction to the pelvic circulation, whether the latter is due to local or general causes. But it is a question if the intense injection of the peritoneal covering of the tube, as well as of the mucosa, is more marked in the latter case than it is during menstruation, since, even under apparently normal conditions, the pressure in the vessels may be so great as to give rise to punctate hemorrhages. It will be evident that we never can inspect the tubes in the human subject under proper conditions for deciding this point; it is certainly not safe to rely absolutely upon the appearances observed at the operating-table, either while the organs are *in situ* or immediately after their removal. In cases in which the active hyperæmia of the menstrual nisus is added to the passive congestion resulting from venous obstruction, we obtain the best picture of hyperæmia of the tube; which condition, if prolonged even for a short period, leads to so-called catarrhal salpingitis; this hyperæmia is to be distinguished from that due to chronic changes within the tube itself or to vascular obstruction produced by peritonitic adhesions. The following is a brief description of a tube observed *in situ* in the living subject during menstruation, the active congestion being heightened by a certain amount of general venous obstruction due to the action of the anæsthetic upon the lungs: The entire oviduct was visibly increased in size, and its peritoneal covering, instead of presenting the ordinary pinkish hue, was of a purple color; the fimbriæ were swollen and injected. The mucous membrane, normally of a pinkish shade toward the abdominal end of

the tube, changing to a pale gray on approaching the uterine end, was generally swollen and presented a uniformly dark-red color. There was a slight increase of the usual amount of secretion on its surface. A short time after its removal there was nothing about the specimen to distinguish it from an ordinary normal tube, unless the mucosa in the former case was of a redder hue.

Perhaps the best examples of pure passive hyperæmia of the tubes are observed in the bodies of infants who are born asphyxiated, since the conditions are quite simple and every possible local disturbance is eliminated.

Hemorrhage into the Tubes.

Hemorrhage into the tube may vary, as in the case of the ovary, from punctate extravasations to actual rupture of good-sized vessels, with escape of blood into the tube, and even into the peritoneal cavity. Although the hemorrhage may be either subperitoneal or interstitial, it is necessarily limited in amount in these regions, whereas when the blood escapes into the interior of a patent tube there is no limit to the quantity which may be discharged.

We would expect to find ecchymoses in or just beneath the tubal mucosa as a result of intense and prolonged active hyperæmia; it is doubtful if this ever occurs in the normal tube during menstruation, although it may follow if the menstrual congestion is added to existing inflammation. Punctate extravasations in the mucous membrane are found in subjects of all ages, and are due either to venous obstruction or to decomposition of the blood; the former are observed in cases of chronic cardiac, hepatic, or pulmonary disease, the latter in connection with infectious diseases, rarely after extensive burns or phosphorus-poisoning. These extravasates possess no importance clinically, and are rapidly absorbed, leaving microscopical collections of pigment.

If the pressure is prolonged and excessive, a vessel may rupture and blood may escape into the tube: the capacity of the latter being limited, if the abdominal end is patent the blood will ooze into the peritoneal cavity, forming an hæmatocele, the location of which will naturally be behind the broad ligament—*i. e.* retro-uterine. Fatal cases have been recorded. This accident is to be distinguished from effusion of blood due to actual rupture of the tube in hæmatosalpinx or extra-uterine pregnancy.[1] Bandl even goes so far as to state that in most cases blood escapes from the tubal mucosa during normal menstruation, and that, in consequence of the temporary dilatation of the uterine openings, this blood is able to make its way into the uterus.

[1] For further information on this subject consult the article on "Pelvic Hæmatocele and Pelvic Hæmatoma" in Vol. I.

Hæmatosalpinx.

This signifies, in general, the retention of blood within the tube, whether the latter be patent or not; but the term has come to be used in a restricted sense, so that we now understand it to mean dilatation of an occluded tube by a considerable accumulation of blood. That the tube must be more or less impermeable in order to admit of any appreciable accumulation is evident from the fact that the effused blood rarely coagulates, but remains fluid, and would under increasing pressure tend to escape from the ostium abdominale if this were open. Bandl, in common with other writers, lays most stress upon the condition of the uterine opening, which he believes is so patulous during menstruation as to allow the blood from the tube to escape into the uterus; constriction of the tube at this point leads to the formation of a hæmatosalpinx. I have observed this condition in connection with such a narrowing of the proximal end, but it was accompanied with an obstruction of the distal extremity. It is readily conceivable that the abdominal opening of the tube was originally patent in many of these cases, so that the blood escaped into the peritoneal cavity, producing localized peritonitis which occluded the tube. It is to be noted that the distension is seldom uniform, but is confined to one or two portions of the tube, especially the distal end. This localized dilatation is readily explained, in the absence of external constricting bands, by angular flexion resulting from an exaggeration of the natural tortuosities. It will be considered more particularly in connection with Hydrosalpinx.

Hæmatosalpinx might be termed primary or secondary according as the blood is effused into a previously healthy tube or into one the walls of which are already thinned and dilated in consequence of pre-existing inflammation. Theoretically, the danger of rupture from a sudden increase of the pressure would be much greater in the latter case; practically, it would be difficult to distinguish between these conditions from the examination of a given specimen.

The source of the effusion has formed the subject of no little speculation. In a few instances the blood was apparently derived from a ruptured Graafian vesicle, the fimbriated extremity of the tube being fused with the ovary, as in cases of tubo-ovarian cyst. The frequent association of hæmatosalpinx with atresia of the utero-vaginal canal has led to the natural inference that the accumulation of blood within the tube was due to simple regurgitation from the uterine cavity. Such cases are the exception; the ostium uterinum is generally found to be obstructed, so that blood can escape neither from nor into the uterus. In Kiwisch's well-known case of hæmatosalpinx the uterus was absent. Moreover, if the distension of the tube was the result of

back-flow from the uterus, one would invariably expect to find *both* tubes dilated, whereas the dilatation is more commonly unilateral. Unquestionably, the blood is in the majority of cases derived from the tubal mucosa; in other words, it has an independent origin. The question at once suggests itself, Why is this blood effused or sweated in one case and not in another where the conditions appear to be identical? If, according to Bandl's theory before mentioned, blood is normally discharged into the uterus during menstruation, why does not retention occur more frequently in connection with other morbid conditions besides atresia? But hæmatosalpinx is relatively infrequent: Winckel observed it only four times in nearly two hundred cases of tubal affection. A review of the statistics of laparotomists shows considerable difference of opinion as to its frequency. Doubtless not a few specimens of supposed hæmatosalpinx are really early tubal pregnancies. Some dilated tubes containing a black, tarry fluid are examples of what may be termed "secondary" hæmatosalpinx; that is to say, a small quantity of blood has been effused into a pre-existing hydro- or pyosalpinx. This is analogous to hemorrhage into an ovarian cyst. This latter fact would seldom be capable of positive proof, since, as will be seen, the changes in the contents and in the wall of the tube may follow, as well as precede, the effusion of blood.

These tumors vary greatly in size and shape; they are usually about as large as an English walnut, but may reach the size of a large orange. The enlargement is commonly confined to the distal half of the tube; hence it tends to assume a globular rather than an elongated shape, such as is observed in hydrosalpinx profluens. Even in cases of atresia uteri the proximal end of the tube usually remains undilated. If only a moderate quantity of blood is effused, it may be absorbed before permanent dilatation of the tube occurs, or the presence of the blood may give rise to a catarrhal process which results in a gradual and progressive increase in the amount of fluid. That is, the condition was originally hæmatosalpinx, but subsequently changed to hydrosalpinx; in fact, this is probably the history of most of the larger tumors which are classed under the former head.

The blood remains in a fluid state for an indefinite period. Klebs attributes this peculiarity to the influence of the tubal secretion, which he compares to the vaginal mucus in its property of preventing the coagulation of menstrual blood. It seems fair to explain this as partly due to the constant increment of serous fluid from the wall of the tube. But whether the addition is blood or serum, it is certain that a hæmatosalpinx tends to gradually increase in size, especially if it is associated with retained menses. In some cases the serum is largely absorbed, while the blood-corpuscles and coloring matter remain. The blood usually has the thick, tarry consistency which character-

izes retained menstrual discharges; sometimes it is so thick as to resemble a coagulum.

As its contents increase the enlarging tube changes its position, provided that no imprisoning adhesions have yet formed; situated at first laterally with regard to the uterus, it becomes more tortuous, and may sink downward behind the broad ligament, surrounding and fused with the ovary. Large tumors, according to Winckel, usually lie above the uterus; under these circumstances the tube must be fixed by adhesions before it has reached a considerable degree of dilatation. As the formation of a hæmatosalpinx presupposes the closure of the distal end in consequence of localized peritonitis, it is probable that the ultimate position of the dilated tube is determined by the position in which it is fixed by the primary peri-salpingitis; its shape and site may be further modified by subsequent inflammatory processes. This question of the environment of diseased tubes will be discussed later.

The changes in the wall of the tube deserve mention. During the early stage of dilatation it becomes hypertrophied, especially the muscular coat, but as the distension becomes excessive atrophy takes place, the wall becoming so thin that rupture is imminent. The mucous membrane atrophies, not always generally, but in spots. But intrinsic changes also occur; inflammation and fatty degeneration further aid to weaken the wall, which has now entirely lost its contractile power. The inflammation affects the peritoneal covering of the tube by direct continuity, and a secondary peri-salpingitis still further distorts the mass. Dense adhesions, completely surrounding the weakened wall, doubtless strengthen it to some extent, so that rupture does not occur. This accident is less frequent than is commonly supposed, and is more often the result of manipulation than of natural causes. Traction on the adherent tubes in consequence of the rapid emptying of a hæmatometra is mentioned by German writers as a frequent cause, but American gynecologists have not been deterred from immediate evacuation of retained menstrual blood by fear of this accident, which, in their experience, has been rare.

The result of the rupture is determined by the character of the fluid which escapes. If it consists of blood, or blood and mucous secretion, it may form a retro-uterine hæmatocele, which becomes encysted; but if ulceration of the wall of the tube takes place and a purulent fluid comes in contact with the peritoneum, fatal peritonitis is the natural consequence. "It is not the blood in itself," as Hennig observes, "but the secretion of the tube which is mixed with it, that gives to the blood effused into the abdominal cavity its capacity for exciting inflammation." Cases have been reported in which the dilated tube discharged its contents into a neighboring viscus to which it had become adherent. There are doubtless some instances in which a hæmatosalpinx empties

itself into the uterus after the atresia of the latter has been overcome, but even if the tube is emptied, such extensive changes have taken place within and around it that their results remain permanent. It is also possible that such a tube may refill and discharge its contents at irregular intervals into the uterus when sufficient fluid has accumulated to overcome the obstacle formed by the narrow uterine orifice. This fluid would be of a serous or sero-purulent, rather than a sanguineous, character. It is also affirmed by some writers that a retro-uterine hæmatocele may discharge into the uterus through a tube.

It may be safely affirmed that as a rule an hæmatocele does not discharge itself in this way or undergo spontaneous cure, since not only is the lumen of the tube obstructed by internal and external cicatrices, but the fluid is too thick to flow readily through the uterine end. That the distal opening should remain patent is contrary to the entire theory of the mode of origin of this condition.

Symptoms and Diagnosis.—We may divide tubal hemorrhages into two varieties—effusions limited to the tube alone, and collections of blood accompanying hæmatometra and hæmatokolpos. The symptoms presented by slight hemorrhages into the unobstructed tube are either *nil*, or are so little characteristic as to be overlooked, even by those who are skilled in detecting obscure pathological conditions of the internal genitals. The sudden discharge of a quantity of retained or disintegrated blood toward the end of the menstrual period has been regarded by some competent observers as an indication that blood retained within the tube has been forced into the uterus. If this phenomenon is preceded by colicky pains in the region of the tube, and the latter is felt to be enlarged before, and diminished in size after, the discharge, the evidence is regarded as quite conclusive. It must be confessed that there is ample room for error in such observations, as the blood may have been retained within the uterus, and the change in the calibre of the tube may have been merely apparent.

Hæmatosalpinx gives rise to symptoms which closely resemble those of hydrosalpinx (*q. v.*). The tumor has essentially the same form and relations, but in the case of hæmatosalpinx an increase in its size can be detected at the menstrual period, as fresh blood is effused into the sac. Rupture of the tube is more common in the latter condition, on account of the sudden increment to its contents. Consequently, the appearance of symptoms of collapse and internal hemorrhage at the time of menstruation in a patient with an enlarged tube (assuming that the history of the case excludes extra-uterine pregnancy) might point to the rupture of a hæmatosalpinx rather than a hydrosalpinx. However, the majority of the cases examined post-mortem in which blood escapes into the peritoneal cavity are doubtless early tubal pregnancies which are not recognized.

When associated with retention of blood in the uterus and vagina the diagnosis of hæmatosalpinx is less uncertain. The presence of an elongated tumor on one or both sides of the enlarged uterus, which gradually increases in size and gives a more or less distinct sense of fluctuation, could hardly possess any other significance. It is unnecessary to say that in such cases the symptoms presented by the distended tubes in their efforts to expel their contents are masked by those referable to the hæmatometra.

Prognosis.—Slight effusions of blood into the tube are doubtless completely absorbed. Circumscribed interstitial hemorrhages possess less significance than do those in the ovary, as the wall of the tube is so much more simple in its anatomical structure. The blood is entirely absorbed, or its site is indicated by microscopic deposits of pigment. In a certain proportion of cases a single hemorrhage may form the starting-point of hydrosalpinx. As the fluid accumulates in hæmatosalpinx the wall becomes thinned through pressure and fatty degeneration, and rupture is imminent. This may take place into the peritoneal cavity, forming hæmatocele, or if, as usually happens, peritonitis is set up, the sac may become adherent to some hollow viscus, and may subsequently rupture into it. Suppuration of the contents of the tube is a possible contingency, when the already thinned wall may be perforated and fatal peritonitis result. The danger is greater in this case than in pyosalpinx, as the suppurative process is more acute in hæmatosalpinx, and the wall of the tube has already been atrophied by long pressure.

The danger from rupture of the tube after sudden evacuation of retained menstrual blood in cases of atresia uteri is due not to contraction of the muscular wall of the tube in its efforts to force the retained blood into the uterus (the wall has become so atrophied as to lose its contractile power), but to the tearing of the adhesions around the tube by the rapidly-contracting uterus, which results either in immediate rupture or in inflammation and subsequent perforation.

In general, hæmatosalpinx may be regarded as a serious condition, second only to pyosalpinx; indeed, from its proneness to rupture it may be regarded as in one sense more serious than the latter, since it may terminate life more suddenly. When our knowledge of tubal pathology becomes more exact we may place pure hæmatosalpinx on nearly the same level as tubal pregnancy. But blood long retained and decomposed within a tube will excite primary peritonitis when effused into the abdominal cavity, which is less apt to result from the fresh hemorrhage that follows rupture of an ectopic sac.

Treatment.—Puncture of a hæmatosalpinx with an aspirating needle is only advisable when the sac is easily accessible through the vaginal fornix, and then simply as a diagnostic measure. As soon as the

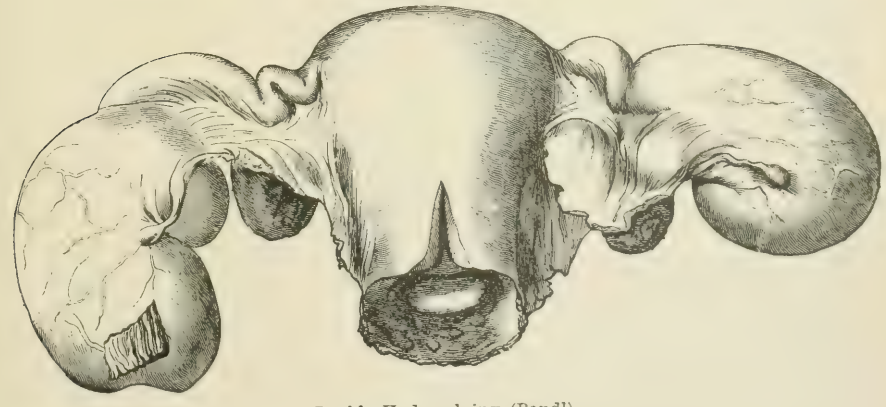
tumor is recognized as a blood-cyst, no attempt should be made to withdraw its contents. Aspiration through the abdomen is a procedure which is opposed to modern principles of surgery. Laparotomy is the only recognized treatment of this variety of tubal enlargement, as of every other. In fact, all operators of large experience can recall cases in which a supposed typical pyosalpinx proved to be a hæmatosalpinx. As it is impossible and unnecessary to attain absolute accuracy in the diagnosis of these affections, so it is unwise to recommend palliative measures.

After retained menstrual blood has been successfully evacuated, and the tube (as commonly happens) remains dilated, it should be removed without delay, since the patient's danger is scarcely less imminent than it was before the uterus was emptied. In the light of modern teaching we may go a step farther and advocate the immediate performance of laparotomy in cases in which rupture of the tube results from the rapid evacuation of hæmatometra.

Hydrosalpinx.

Pathology.—This condition, which has also been termed tubal dropsy (hydrops tubæ), is simply a sequence of catarrhal salpingitis, like hæmato- and pyosalpinx—*i. e.* dilatation of the tube, and the accumulation within it of a quantity of serous fluid. The difference between these three forms of dilatation is often a difference in name

Fig. 308.



Double Hydrosalpinx (Bandl).

alone, since the contents of a so-called "hydrosalpinx" may be sanguineous or muco-purulent. But there are other features peculiar to the latter condition which render it essentially different from the other

two, so that we may properly regard hydrops tubæ as an enlargement of the tube *sui generis*, originating like the others, but much less serious to its possessor.

Hydrosalpinx has been described as a form of retention-cyst—an analogy probably suggested by the distension of the vermiform appendix from accumulation of mucus; but this comparison is inaccurate, since dropsy of the tube is not a mere accumulation of the normal secretion of mucous membrane, but is the result of a true inflammatory process. It is not necessary that there should be entire closure of one or both openings in order that a considerable amount of mucus may be retained in the tube; the swelling of the mucosa alone may be enough to hinder the outflow, but such an accumulation alone does not constitute hydrops tubæ. There must be actual pathological changes in the wall of the tube which permit it to dilate under the pressure of the retained fluid; to this end one or both ostia must be closed. If both are occluded, the condition is that termed by Froriep *hydrops tubæ occlusa*—*i. e.* the entire tube is dilated; if the uterine opening remains patent, so that the accumulated fluid under increased pressure can escape into the uterus, he terms it *hydrops tubæ apertæ*.

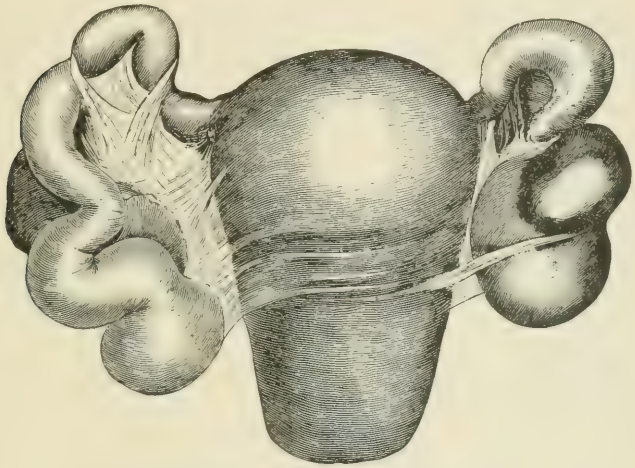
Angular flexion in the outer third of the tube, or strictures due to peritonitic adhesions, may also form an efficient obstruction to the escape of fluid from the ostium abdominale. The commonest cause of tubal obstruction is closure of the distal opening in consequence of a localized inflammatory process which has resulted in agglutination of the fimbriæ or adhesions of the same to the ovary. Tait refers to the latter as being "perhaps of congenital origin, but more probably the result of inflammation." In both instances the occlusion is to be referred to catarrhal salpingitis, which in the latter case did, in the former did not, give rise to localized peritonitis of a less severe grade than that which attends purulent inflammation of the tubal mucosa. The frequent occurrence of double hydrosalpinx naturally suggests a common inflammatory origin in both tubes. It is not necessary to assume, with some writers, that the contents of the tube escaped into the peritoneal cavity through an ulcerative perforation or by transudation through the tubal wall.

In addition to causing closure of the ostium abdominale, the primary peritonitis (so termed in order to distinguish it from that which develops *after* the dilatation of the tube) may also cause flexions and strictures at one or more points in the course of the tube. The tubal wall has already been softened by the catarrhal process, so that it yields readily to the gradual pressure exerted by the accumulating fluid, becoming uniformly thinner by reason of muscular atrophy. The initial step in the dilatation may be a moderate effusion of blood into the tube (see Hæmatosalpinx), or the retained fluid may be increased by hemorrhage

from rupture of a vessel in the thinned muscular coat. The hydrosalpinx may become a pyosalpinx from secondary ulceration of the wall and consequent admixture of pus.

The shape assumed by hydrops tubæ varies according as the entire tube or only a portion of it is distended, and as it is free or distorted by surrounding adhesions. The more distensible outer half of the

Fig. 309.



Double Sacculated Hydrosalpinx (Bandl).

tube enlarges first, and if perfectly movable it presents a tense cylindrical or ovoid sac (see Fig. 308), which sinks downward behind the corresponding broad ligament. If a constriction exists at the middle or outer third of the tube, the swelling is more nearly globular, the remainder of the tube being of normal calibre. The tube is sometimes bent or constricted at several points, so that separate collections of fluid are formed. Rokitansky has called this form *hydrops tubæ saccatus*. (See Fig. 309.) The inner third of the tube is not usually dilated, since the flexion near this point, caused by the bending of the distal portion from its increased weight, prevents the accumulated fluid from passing beyond the bend until the pressure has become extreme, when a portion of it may be forced into the uterus. It should be noted that the adhesions around a pure hydrosalpinx are seldom so firm and extensive as those associated with pyosalpinx, for the reason that the fluid discharged from the tube at the time of the primary inflammation was less irritating, and the comparatively bland nature of the retained secretion is less likely to cause recurrent attacks of peritonitis. (See Pyosalpinx.)

The whole appearance and relations of hydrosalpinx are different from those of purulent distension. Instead of being a general cylin-

dical hypertrophy of the tube, which gives only a doughy sensation, or at the most imperfect fluctuation, the former is a pyriform cyst, with thin, often translucent, walls and a tense fluctuating feel. The exterior of a hydrops tubæ is seldom covered with a thick layer of organized lymph or presents a ragged sloughing appearance. A "pus-tube" is nearly always buried in adhesions, tube and ovary being fused together, so that their identity is often lost. The ovary is either completely atrophied or extensively diseased, whereas hydrosalpinx may be associated with but little, if any, trouble in the corresponding ovary. The tube may, however, be united to the latter by adhesions of moderate firmness.

With regard to the dimensions which a hydrosalpinx may attain, authentic reports state that the tumor has reached the size of a child's head; Peaslee withdrew twenty-two and a half pounds of serous fluid from a distended tube which during life was tapped several times as an ovarian cyst. The average specimen is not larger than a small pear, and is slightly constricted at two or three points. (The association of hydrops tubæ with cystic enlargement of the ovary will be considered under Tubo-ovarian Cysts.)

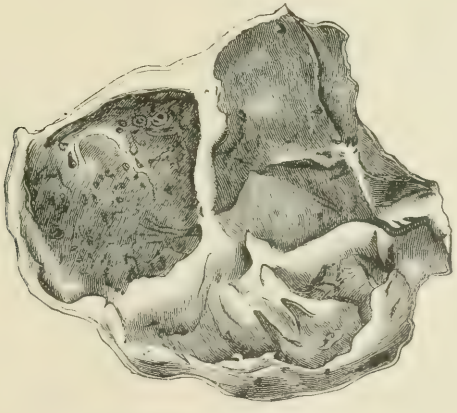
Dilated tubes are usually found in the posterior pelvic fossa near the bases of the broad ligaments and behind the ovaries; it is only the rare tumors of large size that rise out of the pelvis.

In an examination of a typical specimen the following points will be noted: Although the tubal wall is generally thinned, at some points there may be actual hypertrophy, with or without additional thickening from external deposits of lymph. At the lower end of the sac traces of the ostium abdominale are seldom absent, even when the fimbriæ have entirely disappeared. The latter may be rolled into the tube, and may be imprisoned there when it is obliterated, or they may unroll again and remain like a fringe on the surface of the cyst, surrounding the site of the opening; in some cases the latter exists only as a small cicatrix on the surface of the sac, no traces of peri-salpingitis being present. By straightening out the various bends in the tube and squeezing the sac, fluid can usually be forced into the uterus. On laying open a hydrosalpinx it will be seen that its wall is not of uniform thickness. The distal portion of the tube, having been exposed to greater pressure than the proximal, and for a longer period, may be very much thinned, while the latter may be even thicker than normal in consequence of inflammatory swelling. In the most distended portion the mucous lining has lost its rugæ, and may be so atrophied that it cannot be distinguished as a separate layer. It may be colored reddish or brownish in spots by deposits of blood-pigment (marking the site of punctate hemorrhages), or may present a yellowish appearance by reason of fatty degeneration. Necrosed spots may sometimes be observed, with

evidences of imminent rupture. Where the distension is less the mucosa may be preserved and exhibit the usual changes due to chronic catarrh. The papillary growths described in the interior of such cysts are simply the results of hypertrophy of the mucous membrane analogous to that seen in endometritis fungosa. The muscular layers are much thinned from pressure alone.

The fluid contents of hydrosalpinx vary in character from a thin, clear, watery liquid to a thick brownish one. The color depends upon the presence or absence of blood, fatty degenerated epithelium, and pus. A typical specimen has a yellowish color, rather a low specific gravity, an alkaline reaction, contains a large quantity of albumen (thus differing from the fluid contained in a parovarian cyst) and paraglobulin, occasionally a little chloride of sodium. Microscopically, it sometimes contains pigment and cholesterin, and nearly always quantities of columnar ciliated epithelia, the latter in greater numbers than in parovarian fluid. The importance of this fact (and the presence of albumen and paroglobulin), in connection with the diagnostic vaginal puncture of a small cyst in Douglas' pouch, is self-evident.

Fig. 310.



Hæmatosalpinx: Interior of Cyst.

Microscopical sections of the wall of the sac show nothing of particular interest. In some places the epithelial cells have undergone fatty degeneration and are disintegrated, while in others they have disappeared entirely. Atrophy of the muscular coat, with separation of the bundles, is seen. Collections of pigments will be noted in the submucous layer. There is a general atrophy of the vessels in the thinnest portion of the wall, with dilatation of those in other parts of the sac. Sections through the undistended or slightly dilated portions of the tube show the changes characteristic of chronic catarrhal salpingitis.

The subsequent history of hydrosalpinx is important from its bearing on the prognosis. As before stated, where the uterine end of the tube remains open the pressure of the retained fluid may be so great as to overcome the obstacle caused by a flexion at the proximal end, so that a portion of the contents of the sac escapes into the uterus. This increase in the pressure may be sudden (hemorrhage or menstrual congestion); cases are recorded in which the fluid was thus forced out by mechanical violence, as by a fall or a blow. A periodical flow from the uterus of fluid from a dropsical tube has been noted during or immediately after menstruation; Klob believes that in women who have passed the menopause this phenomenon may simulate menstruation. Rupture of the sac is always possible, since pressure, fatty degeneration, and necrotic processes may reduce the wall to extreme thinness, so that a sudden increase in the amount of fluid (as from a moderate hemorrhage) might easily cause it to give way. If the fluid is purely serous, it may be absorbed by the peritoneum, and no harm may result; but, from what has been said, it is evident that we can never know when the fluid has ceased to be innocuous, by reason of the addition to it of pus or blood. An acute septic inflammation may extend from the undilated portion of the tube to the lining of the sac and its contents, transforming the bland into an extremely acrid fluid, contact of which with the peritoneum would mean death to the patient.

The practical deduction is that hydrosalpinx is a serious condition, and should be treated surgically. Puncture is not a rational method of dealing with it, since the fluid not only reaccumulates, but may assume a purulent character after tapping. Adhesion of a hydrosalpinx to the intestine or bladder, with subsequent ulceration and discharge of its contents, has been reported; in such cases it was undoubtedly transformed into pyosalpinx before the perforation occurred.

II. SALPINGITIS.

By W. GILL WYLIE, M. D.

History.—Medical literature, as far as I have been able to examine it, furnishes only two or three references to diseases of the Fallopian tubes previously to the nineteenth century, and nothing of much importance till 1823. In that year James Blundell, as shown in *The Transactions of the Royal Medical and Chirurgical Society of London*, after having experimented on animals, claimed that the uterine appendages, and even the uterus itself, could be removed without causing death, and he proposed that these organs or any parts of them should be removed for disease when other treatment failed. We have found no evidence that his suggestions were ever carried out.

Previous to 1857 we find, in the writings of Sager, Froriep, Kiwisch, Förster, and others, observations on the pathology of the Fallopian tubes. In that year, in the *Archives générales de Médecine*, appeared the first account of Bernutz's remarkable researches on the nature and pathology of pelvic inflammations. He clearly described the disease clinically, and he showed, pathologically, that it was a disease of the tubes and ovaries accompanied by peritonitis, and that cellulitis had no influence in causing the symptoms, and that it rarely existed except as a phlegmon in puerperal cases. This is the accepted doctrine of to-day—in the past two or three years made plain by hundreds of operations for the radical cure of that large class of cases until recently regarded and treated as chronic cellulitis. The publication of Bernutz's work in 1857 was succeeded by numerous records of autopsies showing the relations of the tubes to puerperal sepsis, and minute descriptions of the pathology of salpingitis—for instance, in the writings of the older Martin, Scanzoni, Förster, Voche, Barnes, Klob, C. Hüter, Wagner, and others. In 1872 the question of practical surgical treatment began to be considered. C. Hennig gives us perhaps the most complete and minute account of the pathological anatomy of the Fallopian tubes.

On July 27, 1872, Hegar of Freiburg, Germany, removed the tubes together with the ovary, but the operation was done for dysmenorrhœa and ovarian neuralgia. In the same year Battey of Rome, Ga., removed the ovaries for similar reasons; but in his earlier writings, as far as I know, he does not refer to diseases of the Fallopian tubes. Lawson Tait, of Birmingham, Eng., also claimed to have removed the Fallopian tubes for disease as early as 1872, and, among English-speaking people certainly, he has done more than any one else, by

his writings and his remarkable surgical skill, to place the operation for the removal of diseased Fallopian tubes on a lasting foundation.

Previous to 1871 American medical literature contained only about a dozen direct references to diseases of the Fallopian tubes, and these are chiefly reports giving accounts of autopsies in which diseased tubes were found. In the *Boston Medical and Surgical Journal* of that year appeared an account of Hennig's anatomy and pathology of the Fallopian tubes, but among gynecologists the subject was not practically taken into consideration for study or treatment.

During 1872 and 1873, I was interne at the New York State Woman's Hospital, then considered the fountain-head of gynecology in America, with J. Marion Sims, T. A. Emmet, T. G. Thomas, and E. R. Peaslee as visiting surgeons. At that time salpingitis was treated as cellulitis or ovaritis. I am certain that no instruction about diseases of the tubes was given, nor was the subject accorded much consideration. During my term of service Dr. Thomas removed an hypertrophied clitoris with the galvano-cautery. The patient did well until the thirteenth day after the operation, when she suddenly developed general peritonitis, and died in twenty-four hours. I was present when the autopsy was made. The physician who acted as pathologist pronounced the disease peritonitis due to the bursting of an abscess of the right ovary. Later I removed the generative organs completely, and took them to my room for examination, and discovered that it was the right tube instead of the ovary that had burst and caused the peritonitis, and that the left tube was also distended to the size of a large lemon with a greenish-colored fluid. I made an exact drawing of the specimen and reported the case in the *American Journal of Obstetrics*, vol. vi. p. 43. That was about all I learned of salpingitis during my service.

In 1876, in the *Transactions of the Gynecological Society*, Dr. Noeggerath published his views on latent gonorrhœa, which had appeared in 1872 at Bonn. His views on gonorrhœal salpingitis attracted general attention, and their acceptance in a great measure accounts for a belief more or less prevalent that gonorrhœa causes nearly all serious diseases of the Fallopian tubes. This, I think, is erroneous, as sepsis after abortions and labor, and the use of pessaries, unclean sounds, etc., are by far the most frequent causes of salpingitis.

The writings of Battey on removal of the ovaries prepared the way for the ready acceptation of the teachings of Lawson Tait in the United States. Previously to 1882 many of us performed what we termed oöphorectomy, or Battey's operation, for the relief of reflex nervous troubles, dysmenorrhœa, and neuralgia, but not until that year can I find a case reported in this country where the operation was done for salpingitis. Many cases of diseased and ruptured tubes revealed in

autopsies had been reported, but operations on such subjects of pelvic inflammation as had repeated attacks of what we then called pelvic cellulitis were not considered justifiable.

In May, 1883, I operated for the first time for the removal of diseased Fallopian tubes. The case was an unmistakable one, for I could by pressing on the tubes cause pus coming directly from the uterus to show itself in the vagina. An eminent scholar, who, with a number of gynecologists, was present, said, after having examined the specimens, that the conditions of the case came nearer to justifying the operation than anything he had seen. This gynecologist now not only operates for the removal of diseased tubes, but he told me only a few days since that he had resorted to abdominal sections for retroversion without disease of the appendages.

In the same year Dr. T. G. Thomas published in the *New York Medical Journal* "A Contribution to the Subject of the Removal of the Uterine Appendages (Tait's operation) for prolonged menstrual troubles with recurrent pelvic inflammation."

During 1883–84 numerous cases operated on for salpingitis were reported by various gynecologists and surgeons, and the subject was one of the leading topics at society meetings. In January, 1885, I read before the New York Academy of Medicine a paper on "The Etiology, Symptoms, Pathology, and Treatment of Diseases of the Fallopian Tubes," reporting fourteen cases operated upon and showing the specimens of each case.

Gynecologists who a few years ago denounced the operation for the removal of diseased tubes are now eagerly seeking cases to operate upon.

Previous to the appearance of Tait's papers in our American journals, as is shown by the approximately complete bibliographical table on salpingitis appended to this paper, operations on the appendages for causes other than cystoma were nearly always termed "oöphorectomy," and little or no importance was attached to diseases of the Fallopian tubes.

It is almost incredible that so grave and common an affection as salpingitis should have been for so long a time, if not unknown, at least not practically considered and treated. One might well ask what was done for these cases in the past and how they were classed. Nothing could be clearer than the demonstrations of Bernutz and Goupil thirty years ago concerning the nature of salpingitis; but the difficulty was that any local treatment in cases that can be diagnosed, except removal by abdominal section, was of little value. Until the teachings of Lister and others showed the importance of cleanliness in surgery, especially abdominal surgery, this procedure was too dangerous to life to be of much practical benefit. Had not there been a steady advance

in surgery since 1872, the pioneer work of Battey, Tait, and Hegar would in all probability have sunk into obscurity or have made a much slower advance. There is no doubt that cases of salpingitis were not less numerous twenty years ago than to-day, for septic influences, not being then understood, were much more prevalent; and it is plain to us to-day not only that local treatment for uterine disease frequently "lighted up" fresh attacks of "old cellulitis" (known, nine times out of ten, to be local peritonitis due to salpingitis), but that the *septic fingers, sounds, and pessaries*—especially stem-pessaries—sent home to chronic invalidism hundreds and even thousands of women who had come to us for some comparatively trivial uterine affection. In this country, at least, before 1882–83 characteristic cases of salpingitis were very common, and went under the name of pelvic cellulitis. If the ovary happened to be large enough to be made out by examination, they would sometimes be called ovaritis. If the uterus happened to be markedly displaced backward and fixed or twisted to one side, they were termed cases of retroversion or lateral version with adhesions, and they were treated as though the displacement was not only the chief disease, but the only one to be treated. We were taught to replace the uterus and keep it in the ideal normal position, and to believe that if we could do so the affection would be cured. If the *soft pessary* caused a septic endometritis and salpingitis and renewed the local peritonitis, or if the uterine repositor used forcibly to replace or move the adherent uterus burst a distended tube and caused a peritonitis, we were told that we had "lighted up an old cellulitis," but that we should not be discouraged. The patient was directed to be put to bed and dosed with anodynes until the acute attack subsided. She was then sent home for six months or a year, to remain in bed or to take such exercise as her ailment permitted. She was ordered hot water as a vaginal douche every day, and was directed to return to have the uterus pried up. The previous treatment was continued until the so-called cellulitis again started up or her money or her faith was gone. This routine has been somewhat modified, but these cases of salpingitis are by some still called cases of cellulitis, and treated by rest, local applications of iodine to the vault of the vagina, and hot-water douches, month after month, without any real benefit except the delaying of acute attacks. Thus, the woman is always a patient, struggling to keep comfortable and waiting for the menopause or for death from pelvic abscess and peritonitis.

Comparatively young men are still teaching the use of soft-rubber pessaries and advocating the use of the uterine repositor where the uterus is bound down by adhesion—a condition now well known to be associated with salpingitis. I am satisfied that a careful study of the diseases of the Fallopian tubes will clear up not only most of the

numerous cases of local peritonitis once regarded as incurable, but also most of the cases of retroversion, retroflexion, and lateral flexion with adhesions, and that their proper treatment will make plain the uselessness and danger of pessaries in such cases. I do not mean to say that every case of local peritonitis will be found due to salpingitis, but that, in the large majority of cases, salpingitis precedes the local peritonitis, and that repeated attacks of local peritonitis are, as a rule, caused by salpingitis.

In my opinion, when the frequency and the gravity of diseases of the Fallopian tubes are generally understood, the occupation of the mechanical pathologist—who assumes that most of the ills of women are due to uterine displacements, and that their ailments will be overcome when version or flexion is corrected and the uterus held by a pessary in an ideal normal position—will be substantially gone.

Etiology.—It is difficult to conceive a salpingitis starting up as a primary disease independent of any disease of the uterus or ovaries. It is generally conceded that it is due, in almost all cases, to the extension of inflammation from the uterus to the Fallopian tubes, and that endometritis, whatever be the cause of it, is liable to result in salpingitis.

Previously to puberty and functional activity of the generative organs endometritis is rare, and we do not expect to find salpingitis. Certain congenital deformities may lead to disease of the tubes, such as occlusion of the vagina or os uteri. The menstrual blood, not finding an outlet, may distend the uterus, and finally be forced into the tubes, and be followed by irritation sufficient to cause adhesions and occlusion of the fimbriated extremity. This distension of the tubes greatly adds to the danger of evacuating the blood by operation, for the tubes may burst during the operation and cause peritonitis, or should sepsis follow the operation we have not only septic endometritis, but septic salpingitis, to deal with.

In imperfectly developed and delicate girls and women the mucous lining, in its degenerated state, becomes an easy prey to catarrhal disease, and an endometritis may extend to the tubes. But in my own experience salpingitis is rare when developed in virgins to a degree which necessitates operation for removal; and when I find enlarged and diseased tubes in these patients I expect to find tuberculosis, unless the anteflexion so common in these cases was treated by the use of a stem-pessary and was followed by a so-called attack of cellulitis.

It is probable that unless the tubes have been enlarged by pregnancy endometritis is not liable to extend to the mucous lining of the Fallopian tubes. On a careful study of my cases operated upon, now numbering 130, only about 10 per cent. could claim to be virgins,

and in the great majority the salpingitis could be plainly traced to septic endometritis following abortion or labor. After abortions the cervix uteri is not so patulous as after labor at term; the cervix is more irritable and likely to contract and to obstruct drainage; any effete matter may be retained in the cavity of the uterus, and when the uterus contracts it may be forced into the Fallopian tubes. It may be a disease of the endometrium that caused the abortion, and this disease may extend to the tubes. Besides, after abortions neither the patient nor the doctor is so likely to take the usual precautions against sepsis or to give time for involution to take place. Subinvolution and endometritis are much more common after abortion than after normal labor. After labor or abortion, when the uterus is enlarged and soft, retroversion is more likely to complicate endometritis and make the extension of disease into the tubes more liable to occur. Septic endometritis, which results in dangerous puerperal fever, often proves fatal by extending from the uterus through the tubes to the peritoneum. As long ago as 1859, Martin of Berlin clearly described these cases and demonstrated them by numerous autopsies. It is a fact that before the days of antiseptics a very large percentage of lying-in cases had more or less rise of temperature; and we know now that this rise of temperature is, as a rule, due to sepsis, and in all probability to septic endometritis. In my opinion, the majority of cases of salpingitis requiring operation are caused by septic endometritis following labor and abortion.

Until recently gonorrhœa in women was considered a trivial disease, probably because it does not produce urethral stricture, as it does in the male; but the writings of Noeggerath and a more practical knowledge of salpingitis have made it plain that it may prove to be a very dangerous disease by extending from the vagina to the uterus and from the uterus to the Fallopian tubes and the peritoneum.

There is no doubt that gonorrhœa is frequently the cause of salpingitis, but I am inclined to think that its influence in this respect has been exaggerated. It is true that salpingitis is a common disease among prostitutes, but abortions are almost universal with these women; and the local peritonitis, which is by far the most reliable symptom of salpingitis, will be found to follow abortions much more frequently than it follows gonorrhœa.

Noeggerath's theory of "latent gonorrhœa" is attractive, but practically it has not been proved. Persons who have suffered from diphtheria may have more or less chronic throat affection, but we would not call the affection latent diphtheria.

Syphilis may cause salpingitis in the same way that it produces otitis or ozæna. Endometritis in syphilitic subjects is often very difficult to cure.

Any abnormal condition that leads to hemorrhage into or on the tube may cause salpingitis. In operating for diseased tubes three times I have found extra-uterine pregnancy as the cause of salpingitis. I am inclined to think that in many other cases, especially where one side is badly diseased, conception, taking place in the tube, the tube bursting within a few days or weeks, has caused the local peritonitis and salpingitis, and that when operated upon the specimens were too much changed by the inflammation to be recognized as extra-uterine pregnancy.

We may safely say, then, that, with rare exceptions, salpingitis is caused by extension of disease from the endometrium to the mucous lining of the tube. It is true that we often operate for diseased tubes and find the uterus relatively free from disease, but the endometritis or acute disease causing the salpingitis may months, or even years, ago have passed off, leaving the tubes diseased.

But aside from tubal pregnancy, there is reason to believe that the tubes may become diseased without extension from the endometrium. Salpingitis, it is claimed, has accompanied some of the essential and eruptive fevers. Certain diseases of the ovaries which result in suppuration, such as dermoid cysts, may cause salpingitis by direct extension or by inflammatory exudations closing the fimbriated extremity. Pelvic hæmatocele and cancer may produce salpingitis in the same way.

Abnormal ovulation—that is, the formation of large cysts with irritating fluid in them—may in certain conditions of the general health result in inflammation, adhesions, and salpingitis. As a rule, we rather expect the ovary to become affected by the escape of septic fluid from the tube upon and about the ovary.

Anything that stops up or diminishes the lumen of the tube may obstruct drainage, cause distension, and result in salpingitis.

Intra-uterine injections may force poisonous or irritating fluid into the tube and produce inflammation. This may be caused by distension of the uterine cavity as well as by the force of the injection: the fluid, not escaping freely from the os uteri, or possibly by the force of a uterine contraction, enters the tube. In the hands of an eminent gynecologist, I saw a small No. 7 catheter used to give a uterine injection for sepsis following incision for dysmenorrhœa. A pint of fluid with two drachms of carbolic acid dissolved in it was forced by a syringe, as supposed, into the uterus, but when the bedpan was examined it was found that not one drop of the fluid had returned. The catheter had without doubt entered the Fallopian tube, and the solution had entered the abdominal cavity. Shock appeared before the injection was finished, and was followed by a dangerous attack of peritonitis, resulting in a pelvic abscess which finally opened into the bladder and entailed years of suffering.

Physical injuries, such as blows and falls, may excite acute attacks of local peritonitis by bursting or tearing tubes distended with septic or irritating fluids, or by bursting ovarian cysts; but it is doubtful whether so small and movable an organ, if normal, protected as it is by the bony pelvis and soft tissues, can be seriously injured by a fall or blow that would not at the same time kill the patient.

I have in several cases found the vermiform appendix firmly adherent to a diseased tube, and it seems probable that a perityphlitic abscess might involve the right tube and cause salpingitis.

Not the least important cause of salpingitis is want of cleanliness in the hands, sponges, and instruments of physicians making local examinations or operating on cases of uterine disease, and thus starting up septic endometritis. Sponge tents and other kinds of tents used to dilate the uterus are especially likely to cause septic endometritis or to cause septic or irritating fluid to be forced from the uterus into the tubes by preventing its drainage or escape from the os uteri, especially when the irritation of the swelling tent brings on violent uterine contractions, as it nearly always does. All of us can look back ten or fifteen years and remember how commonly a severe chill with fever followed the use of uterine tents, especially when they were renewed several times in succession; but we called it "cellulitis," and kept on using these unsurgical and dangerous instruments even when rendered aseptic. Since the introduction of good steel uterine dilators the tent is becoming, and should become, obsolete.

Next to the uterine tent comes the equally unsurgical and dangerous vaginal, and especially uterine, tampon. Before the days of antiseptics the tampon caused hundreds of cases of salpingitis every year. Like the tent, it violates what is, next to cleanliness, the most important law of surgery—namely, drainage. Besides, it is frequently used in just the class of cases most liable to become septic, and is most dangerous to life when sepsis begins, such as in hemorrhage after abortions, etc. To-day an expert surgeon who knows how to use hot-water irrigation alternated with ice-water, or to bring on uterine contraction by the use of Churchill's iodine, or how to pass a needle so as to constrict the uterine artery, need rarely if ever resort to a vaginal, and never to a uterine, tampon to stop uterine hemorrhage. Empty the uterus of retained matter or new growths and stop hemorrhage without using any kind of tampon. Tampons can be and should be abandoned. Used in the ordinary way, they rarely ever stop a dangerous hemorrhage.

Symptoms and Diagnosis.—*Subjective Symptoms.*—Acute salpingitis is so frequently associated with uterine disease that a diagnosis is not always easily made. Perhaps the most reliable indication of severe salpingitis is the occurrence of repeated attacks of local peritonitis, but

during the acute stage an attack of acute metritis, when the uterus is enlarged, so closely simulates local peritonitis that time alone enables one to make a clear diagnosis. In each disease the same pains and sensitiveness occur, and, except under ether, the uterus will seem to be fixed in the pelvis. With a severe metritis there are without doubt frequently associated salpingitis and local peritonitis. As a rule, an excessive or prolonged menorrhagia or metrorrhagia takes place during the acute stage of salpingitis. Wet feet and exposure to cold may be exciting causes by suppressing menstruation and inducing a catarrhal endometritis; but when exposure is followed by peritonitis I would always look for a latent salpingitis or some equivalent cause of the disorder.

The subjective symptoms of chronic salpingitis are very variable. A peculiar burning pain over the seat of the tube affected is perhaps more characteristic than any other symptom; but many patients do not have it. Local sensitiveness and a dull pain over the tubes and ovaries are about the only constant symptoms. A dragging pain or sensation when the patient stands, or backache and headache, which are supposed to arise from displacement, and which are so commonly associated with, and often due to, the diseased tubes, are sometimes present.

Dysmenorrhœa is a common symptom, but in some cases the flow gives relief by lessening the congestion. I am inclined to believe that the pain is often caused by the endometritis or by the contraction and hyperæsthesia of the mucous membrane which accompany it, for where stenosis and endometritis are cured the dysmenorrhœa, as a rule, disappears. In cases where the disease is mainly in the tubes and ovaries the pain comes on a week or ten days before menstruation, and is mitigated when the flow begins, and with a free flow may disappear entirely. Menorrhagia or metrorrhagia is often associated with salpingitis, but in chronic cases I think it will most frequently be found to be due to vascular changes in the lining membrane of the uterus; and a thorough curetting with a good instrument may effect a cure, although great care must be exercised in preparing the case for operation, lest the salpingitis be so disturbed as to start up peritonitis.

Sterility is the rule in salpingitis. When both tubes are affected—which is usually the case—it is incurable; but when only one side is affected and the proximal end of the tube of the diseased side is closed, pregnancy is possible and may go to full term; but as the uterus enlarges there may be severe local pain, and abortion is likely to occur.

Objective Symptoms.—In acute cases there are usually so much swelling and tenderness that about all we can make out is a fulness or thicken-

ing of one or both broad ligaments, associated with more or less fixation of the uterus. In such a case the patient should be kept in bed until the painful symptoms subside. Then place thin pledgets of cotton saturated in a mixture of boroglyceride one part and pure glycerin fifteen parts against the cervix uteri two or three times a week, and, as the case becomes subacute, add alum to the mixture and continue the pledgets for from three to eight weeks. The inflammatory products will be so much absorbed or stretched that the uterus will become more movable, and an expert may be able to define an enlarged tube or a mass which contains a diseased tube or ovary more or less prolapsed and adherent in one or both broad ligaments. A diagnosis may be more easily made in the subacute than in the acute form of the disease, but a doubtful case can often be cleared up by the treatment recommended for acute cases. It is especially easy when only one side is affected and the uterus is not retroverted. Of course much will depend upon the thinness and laxity of the abdominal walls, and now and then a case will be found in which, to obtain a clear diagnosis, it is necessary to examine the patient under ether. The floor of the pelvis is occasionally so fixed by adhesions, and there is so much venous congestion or enlargement of the pampiniform plexus, especially of the left side, that a specific diagnosis cannot be made; a prolapsus of or adhesions to the sigmoid flexure may augment the difficulty. Tubes affected by catarrh are sometimes not distended and cannot be made out by the sense of touch. In chronic cases the ovaries are apt to be more or less cystic, or are often infiltrated and enlarged by inflammatory products, and are nearly always prolapsed with and folded under the tubes on either side.

Sometimes, when the proximal end of the tube is patulous, the discharge will enter the uterus; and I have seen one or two cases where, from an accurate knowledge of the state of the uterus and vagina, it could be made plain that the gleety discharge had come from the tube. After cleaning the vagina and uterus fresh pus could be made to appear in the vagina by slowly pressing upon the distended tube. The fluid may escape intermittently into the uterus, and if irritating may set up each time an acute endometritis. Now and then a distended tube will empty a large amount of fluid into the uterus at once. For the time the fluid flows freely from the vagina, and the tube will refill and again discharge. In many doubtful cases an examination under ether will enable us to make out the enlarged tubes and ovaries.

No attempt has been made to define the symptoms of the different kinds of salpingitis. Aside from the difficulty of doing so, practically we need only inquire whether salpingitis exists, and whether the case is one that can be best treated by general and local treatment or by

operation. Since catarrhal salpingitis without adhesions or occlusion of the tubes cannot be diagnosticated by the sense of touch, and is usually associated with catarrhal endometritis sufficient to account for all the special subjective symptoms, it is very doubtful if it can be diagnosticated at all. Besides, it has not yet been satisfactorily determined what specific condition of the mucous membrane is to be considered abnormal. The amount of mucus and the appearance of the membrane will certainly be found variable on account of the effect of menstruation and of other conditions of the uterus which cause congestion or inflammation of that organ.

Practically speaking, it is very doubtful if we can consider the tubes diseased unless they are enlarged or the walls either greatly thickened or atrophied, or the cavity distended; and it is exceedingly rare to find either of these conditions without occlusion of the tubes and peri-salpingitis causing peritoneal adhesions. Any active disease of the tubes would in a short time cause such a hypersecretion of mucus that it could not be drained off through the uterine end, and would escape into the peritoneal cavity from the fimbriated extremity, and be almost certain to cause more or less local peritonitis, exudation, and adhesions.

In salpingitis the ovaries are frequently found diseased, and in the more severe forms if not actively diseased are so bound by adhesions that the process of ovulation is abnormal. The symptoms of the ovaritis cannot, however, often be distinguished from those of the salpingitis.

Having made the diagnosis of salpingitis, it is of great practical importance for us to be able to detect the beginning of an abscess or the rapid formation of pus in either the diseased tube or ovary. As a rule, the formation of pus is indicated by a chill or chilly sensations with rise of temperature, and by careful and regular examination the rapid increase in the size of the indurated mass about the broad ligaments can be detected. If left to nature, the mass will become more firmly encysted by peritoneal exudation, or it will increase in size and the pus will burst into the rectum, vagina, or the connective tissue of the pelvis, and point above the brim or through some foramen, or it will burst into the peritoneal cavity and cause general peritonitis.

The conical shape of the tumor or the elastic nature of the thin walls of the tubes may enable us to distinguish hydrosalpinx from pyosalpinx, and, as a rule, the local pain and subjective symptoms are not so severe or so acute as in pyosalpinx, but in many cases we are uncertain what we shall find until we open the abdomen.

Tyler Smith in 1849 claimed that he could catheterize the Fallopian tubes. Experiments made by Albers, Hennig, and others proved the

danger and impracticability of accomplishing any good by the use of sounds. We know that in the class of cases which might be benefited if we could successfully drain the cavity of the tubes through the uterus the slightest attempt to dilate or even sound the uterus may be followed by local peritonitis, and that in other cases the tubes are so tense and distended that very slight manipulation causes them to burst and the fluid to escape into the peritoneal cavity and prove fatal. It is extremely doubtful if anything can be done by catheterizing the Fallopian tubes which would not prove to be much more dangerous than beneficial.

Pathology.—To appreciate the pathology of the subject one must keep in view certain anatomical facts. The tubes are developed with the uterus from the ducts of Müller, and, like the uterus, have a mucous lining, a layer of longitudinal and one of transverse muscular fibres, and an outer covering of peritoneal tissue. The mucous lining is continuous with that of the uterus through a small opening, and it is covered with ciliated epithelium with the current from the ciliæ directed toward the uterus. The membrane lies in longitudinal folds, and appears to fill up the lumen, which at the junction of the tube with the uterus is about one line, and increases in size toward the fimbriated extremity. The muscular coat is given off from the cornua of the uterus on either side. The tubes are about 3½ inches long, the left usually being the longer. They are covered by the same peritoneal fold which includes the broad ligaments, and they run along and form their upper border. They float in the pelvis at either side of the uterus and tend to drop backward when the patient is reclining. The ends open into the peritoneum and terminate in several delicate fimbriæ. One of these fimbriæ is attached to the ovary, which lies on the broad ligament just below the tube, somewhat nearer the uterus than the extreme end of the tube, and causes the end of the tube to turn in and backward to grasp the ovary. Beneath the tube in the broad ligament is the pampiniform plexus, a congeries of veins which is often included in the ligature passed to tie off the tube and ovary.

The broad ligament is stretched from the side of the uterus to the pelvic bones on either side, but is loose enough to allow of free motion of the uterus backward and forward, while limiting the lateral motion. To tie off all the tube and ovary to within half an inch of the uterus it is necessary to fold in a goodly part of the broad ligament, and when both sides are tied off the normal mobility of the uterus is for a time interfered with; but when completely healed the uterus is usually abnormally movable.

In studying diseases of the tubes it must not be forgotten that once every month the tubes, together with the uterus, become engorged with blood, and thus undergo a change likely to aggravate or disturb the

course of disease or repair; that about once a month ovulation takes place in one of the ovaries, and that the ovum, with a certain amount of serous fluid, escapes, and is supposed to be carried by the tubes into the uterus. It is also important to keep clearly in view the anatomical relations of the rectum and ureters to the broad ligaments and uterus.

As a rule, acute salpingitis will be found associated with either acute or chronic endometritis—catarrhal, specific, or septic.

Chronic salpingitis will be found nearly always associated with pelvic peritoneal adhesions involving the broad ligament, ovary, and frequently diseased ovaries.

Salpingitis is often found complicating dermoid, ovarian, and fibroid tumors, and will often account for the unusual pain felt in such cases.

Hennig, Bandl, and other German authors claim that catarrhal salpingitis is a very common disease, and state that when the tubes are examined in women who have died from other diseases the tubes, in a large percentage of cases, will be found abnormal, the mucous membrane swollen and softened, the outer edges reddened, and the mucus increased in amount and giving an acid instead of a normal alkaline reaction.

Since I am of the opinion that any disease of the tubes, except perhaps hydatids, very soon causes sufficient peritonitis to occlude the fimbriated extremity, I will not undertake to describe any class of cases except those that can be clinically verified. I have often in operating seen tubes which seemed excessively vascular and somewhat enlarged, and in which the mucus seemed abnormal, but I am still doubtful whether they were diseased sufficiently to cause pain or serious symptoms, and have come to the conclusion that unless there are other indications for their removal they should be left in the abdomen.

It is seldom that we have the opportunity to see the tubes during the first stages of salpingitis, for, as a rule, when we operate the chronic state has been reached. In salpingitis, like endometritis, all of the tissues take part in the acute stage; the whole organ is enlarged and greatly congested, the swelling closing or filling up the lumen, and at first all of the tissues are softened. At the fimbriæ, if not over the whole surface, peritoneal exudation has taken place and glued the organ to the ovary or any organ that it has come in contact with. If we operate during the acute stage of the first attack of peritonitis, the adhesions are easily broken down and separated from the enlarged soft and friable tubes, apparently saturated with the serous exudations. The mucous membrane is swollen, so that the lumen is occluded or filled with muco-purulent secretions varying in character with the degree or nature of the disease. In septic cases of an active or virulent type the tube and other tissues may be bathed in pus and very few adhesions formed: the disease is too powerful to be covered up or shut

in by adhesive exudates, the latter as soon as secreted being converted into septic fluid. Such cases usually prove fatal within six days. In the less virulent cases the swollen tube rolls backward behind the broad ligament, covering the ovary and becoming adherent to the posterior surface of the broad ligament, the floor of the pelvis, the rectum, etc. Sometimes the end of the tube is adherent to the side of the pelvis, frequently low down in Douglas' pouch, or the posterior surface of the uterus, or even to the other tube. In rare instances the tube is found twisted over forward and adherent to the bladder. Usually the left tube and ovary fill up most of the posterior and lower part of the pelvis, while the right stands up and is attached to the omentum and small intestines. This is probably due to the fact that the left tube is usually the first affected, and is most frequently found prolapsed independently of any active disease. When the acute becomes the subacute stage the swelling subsides and the adhesions contract, completely closing the fimbriated extremity and fixing the tube and ovary to the walls of the pelvis or other organs. If the uterine end of the tube remains open, the mucous secretions may drain away and leave the tube quiet, and in time give the patient comparatively slight trouble. But, as a rule, a chronic salpingitis takes the place of the acute stage, for the lumen affords very imperfect drainage; and menstruation, or rather the increase in size of the vessels of the pelvis which precedes menstruation, begins a week or ten days before the flow, causing an aching pain. When the patient stands up she has a dragging sensation, due to the weakened blood-vessels filling and causing pressure, or to the uterus dragging on the sensitive ligament. If the associated uterine disease has passed off and menstruation takes place normally, the flow of blood relieves the pain in the diseased tube and imprisoned ovary, and for a time the patient may be better; but if it is active and the flow is scant, the congestion remains, and the pain in the tube is aggravated and lasts for several days. It may subside for a few days, but soon the process begins again. The chronic catarrh of the tubes gradually causes a thickening and induration of the mucous membrane, and in time, by pressure, infiltration, and degeneration, affects all the tissues of the tube and increases its size from that of a lead-pencil to that of the thumb or of a much larger body, usually being club-shaped. Or the secretions may be retained and greatly distend the tube, or be converted into pus and form an abscess. The retained fluid may be thin and watery and light-colored, or it may be muco-purulent and gluey in appearance, or it may mix with blood or have a greenish tinge. The diseased tube may be constricted in places or convoluted: a part of the tube may be hard and small, and the rest distended and thin. The ends may be adherent, and the remainder of the tube free and distended. In hydrosalpinx the tubes may be enormously distended to hold several

ounces, and even a pint or more, of fluid. (See Fig. 311.) Hydrosalpinx[1] is probably only a late stage of catarrhal salpingitis. The tubes

Fig. 311.

Hydrosalpinx (exact drawing of specimen).

may be shortened and hardened and atrophied, as in Fig. 312, the ovaries being cystic and atrophied.

Cystic degeneration of the ovaries in chronic cases of salpingitis seems to be the rule, as shown in Figs. 313 and 314. Whether the cysts are

Fig. 312.

Hydrosalpinx, with Atrophied Ovaries.

the products of abnormal ovulation or not, I do not know. They may burst and cause a local peritonitis, and greatly add to the pain and discomfort of the patient. I think that the contact of the fluid of these

[1] For further discussion of hydrosalpinx, see p. 903.

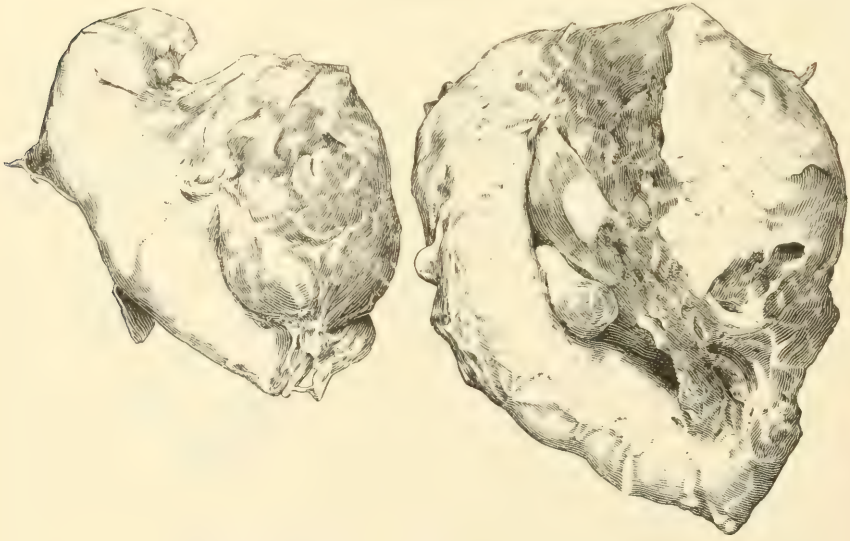
cysts with the diseased contents of the tubes is what often causes abscesses to form in the ovaries and tissues about the ends of the tubes.

FIG. 313.

Atrophied and Contracted Tubes caused by Salpingitis.

Fig. 315 shows a specimen after the escape of several ounces of pus found in the tissues of the ovary and end of the tube.

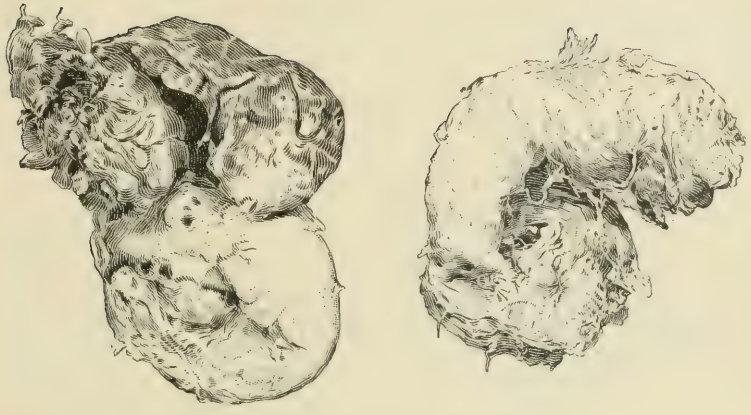
FIG. 314.



Chronic Salpingitis and Cystic Degeneration of the Ovaries.

Fig. 316 shows characteristic specimens of tuberculous disease affecting the tubes and ovaries. The tissues are infiltrated with a cheesy matter and covered by soft, friable peritoneal adhesions.

Fig. 315.

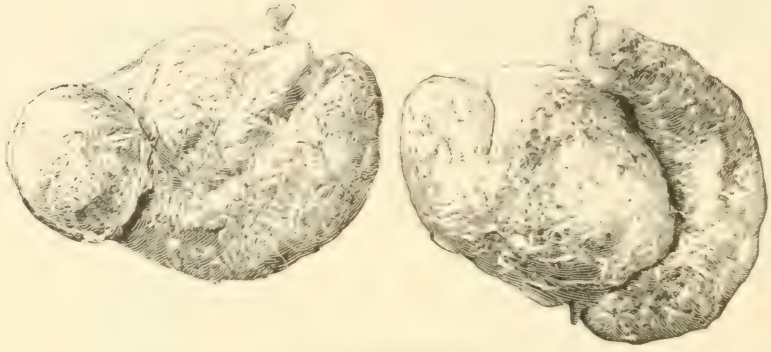


Chronic Salpingitis, with Abscess of the Ovary.

Tuberculous Salpingitis.—Tuberculosis of the tube was formerly included among neoplasms, but is now properly regarded as a specific form of inflammation. Primary tuberculous disease of the tubes was formerly regarded as very rare, but recent observations have shown that it is more common than was supposed. The characteristic bacillus has always been found in true cases. A distinction must always be made between caseous tuberculous nodules and purulent collections that have undergone caseation. Doubtless the latter condition might be mistaken for primary specific inflammation of the tubes when evidences of general tuberculosis were absent. Winckel states that the tubes alone are affected in nearly 50 per cent. of cases of tuberculous disease of the genital tract, the distal ends being most frequently affected. There is a wide difference of opinion as to its relative frequency, the writer quoted having found it in more than 1 per cent. of his autopsies (in 5 out of 575 subjects). Acute tuberculosis of the tubes has rarely been noted; Wernich's case, in which the lungs were secondarily affected, is almost unique. Chronic tuberculous salpingitis is the form usually encountered, the ovaries being singularly free from the disease. In many cases it is evident that there is direct extension from the uterine mucous membrane. The appearance of a tuberculous tube is not especially characteristic; it presents the ordinary enlargement and distortion seen in chronic salpingitis, being commonly prolapsed and buried in adhesions. It is greatly thickened, and has an irregular, nodular shape, which is due not only to dilatation and sacculation, but also to the development of tubercles in its wall. The lumen may or may not be patent. On section the tube appears dilated and its walls are thickened, not alone from hypertrophy, as in non-specific chronic salpingitis, but from the deposit of caseous material; masses of the latter also fill its interior. Microscopical sections show a caseous

layer replacing the normal epithelium, and below this granulation tissue. The unaffected muscular layer is hypertrophied, and may contain tuberculous nodules in which the specific bacilli are seen.

FIG. 316.



Tuberculous Salpingitis.

FIG. 317.

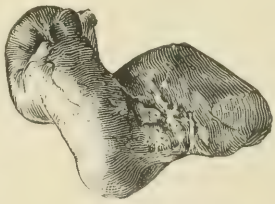
Tuberculosis of the Tubes (Winckel).

The clinical diagnosis of this condition is seldom possible, except in clearly-marked cases of general tuberculosis, in which progressive enlargement of the tubes can be detected by palpation. The presence of several nodules on an enlarged tube might suggest specific disease, especially where the history and physical examination left little doubt as to the existence of general infection. It has been suggested that the finding of tubercle bacilli in discharges from the uterus would be a valuable aid to exact diagnosis. It is unnecessary to say that primary tuberculosis of the tubes is to be determined by the pathologist rather than by the surgeon. Since it rarely happens that this form of salpingitis is discovered before the abdomen is opened, there are no special indications for treatment. As the absence of general infection cannot be positively determined even in cases that are apparently primary, the conditions that prevail are somewhat similar to those in malignant disease of the appendages, the prognosis as regards permanent benefit being doubtful. (See Tuberculous Oöphoritis.)

The adhesions about the diseased tube vary greatly in their nature and extent. Frequent and prolonged attacks of peritonitis cause very dense and firm adhesions, and in old cases the adhesions may be so great as completely to obscure, both to the touch and sight, all signs of the tubes. The surface of the adhesions may be as smooth and as perfect as the peritoneum covering a healthy organ, without a seam or break to distinguish the new formation from that covering the normal organs; and it is necessary to tear or dissect through a point to make a beginning—to tear up the imbedded tubes and ovaries. We may come across a very tough and indurated point of adhesion marking the place where an abscess had perforated into the connective tissue in the floor of the pelvis; and when we operate on a case where the old abscess has previously communicated with the intestine, there is great danger of tearing the gut in separating the adhesion. Or we may tear into the connective tissue on the floor of the pelvis and injure a ureter. Sometimes we may find the cellular tissue between the layers of the broad ligament œdematous from infiltration, making the pedicle thick and soft, but this is about all we ever see of the so-called chronic pelvic cellulitis so warmly advocated by Dr. Emmet and some of his followers.

When there is pus in the tubes, the disease is termed pyosalpinx. The pus may be slight in quantity, with the walls of the tube thickened and in a state of more or less fatty degeneration, the lumen being occluded always at the fimbriated, and frequently at both, ends. It may be thin and the quantity large, the walls may be thinned out, the epithelium denuded, and the muscular coats atrophied. In *hydrosalpinx* the amount of fluid is relatively large, the walls very thin, sometimes almost transparent, and marked over the surface by numerous delicate blood-vessels. The fluid is clear or sometimes tinged with blood. In *hæmatosalpinx* the blood is usually coagulated and the walls of the tubes thickened, but sometimes it is tarry and composed largely of pigment; this pigment may be tarry and closely resemble retained menstrual blood found in the uterus where there is complete occlusion of the vagina, indicating that it is the product of repeated hemorrhages and comes from the walls of the tubes. Similar pigmentary fluid is found in old cysts of the ovaries. I believe that in many of the cases of hæmatosalpinx where only one side was affected and the amount of clotted blood was large, with the walls of the tube much thickened, the cause was tubal pregnancy. I am inclined to think that some of the cases of pelvic abscesses had their origin in tubal pregnancy, which we now know is not very rare.

FIG. 318.



Pyosalpinx.

The pus in pyosalpinx, and likewise in pelvic abscess, varies considerably in its character, or, at any rate, in its power to infect healthy tissues. When it is mixed with mucus or with serous exudation, and is free from odor or gas indicating active decomposition, it is not likely to be followed by septic peritonitis if it escapes during the operation; but when we break into an abscess containing gas, we rarely save our patients, although there may be no direct communication with the intestines. Such pus is found in recent puerperal septic salpingitis or in patients having almost constant general symptoms of septic poisoning, and if possible it should be evacuated without opening the peritoneal cavity.

Prevention.—When the etiology of any disease is well understood its prevention is plainly indicated. It is important that the general health and strength of girls while developing into women should be kept up, so that the generative organs shall fully develop and resist catarrhal disease. When there are symptoms of leucorrhœa and dysmenorrhœa, the disease should be treated early and before it has reached the Fallopian tubes. If the endometrium is affected, the uterine canal should be kept patulous, so as to secure perfect drainage, and thus lessen the chance of the disease entering the Fallopian tubes. The grave nature and the almost certain consequences of venereal affections should be explained to and impressed upon all young persons, and definite instructions should be given, especially to all male patients suffering with gonorrhœa, to avoid intercourse until complete cure is effected. No doubt in many cases the disease which is supposed to be due to septic poisons after labor is caused by gonorrhœa contracted from husbands who have been led astray while deprived of their usual indulgence during the confinement of their wives.

The serious consequences of a salpingitis caused even by a slight septic endometritis forcibly show the vast importance of cleanliness and antiseptics or of any other means that may lessen the chance of puerperal septicæmia. We know that subinvolution rarely exists without the development, sooner or later, of endometritis, and, instead of taking for granted that when a woman has passed the ninth day after labor the responsibility of her physician is at an end, every lying-in woman should be examined locally before she is allowed to go about her usual duties. It is safer to keep the woman under observation until the uterus is normal in size, position, and condition. If treatment is needed, it is better to begin it not later than at the end of the second week after labor. A few stimulating applications of boroglyceride, glycerin, and alum, made twice a week during the third, fourth, fifth, and sixth weeks after labor, will prevent subinvolution, retroversion, endometritis, and salpingitis in a delicate or weak woman who without

such treatment would, it is quite certain, be affected with one or more of these serious troubles.

When we have an endometritis, it is especially important that we should secure perfect drainage from the uterus. After abortions the greatest care should be taken to prevent septic infection and ensure removal of all the placenta and membranes. Especial care should be taken to secure perfect involution and drainage of the uterus, for after labor Nature generally accomplishes this result without help; but this is not so in the case of abortions. Labor is normal; but abortions are abnormal, and almost certain to be followed by disease.

Of course doctors should keep their hands and instruments as clean as practicable; but no sound or instrument should be brought in contact with the uterus unless the vagina has been washed out with an antiseptic solution, for even a clean sound can carry infection into the uterus from the vagina. All septic or sloughing tumors or tissues should be soaked in antiseptic fluids by douche for several hours previously to operation for removal, whereby wounding of the uterus and vagina is certain to occur, so as to avoid the risk of sepsis reaching the blood-vessels or the Fallopian tubes.

Uterine tents and tampons should be totally abandoned, and the tampon in any form should be rarely if ever used.

TREATMENT.—The effects of salpingitis are very variable. Much depends upon the nature of the disease or poison that causes it. Salpingitis due to catarrhal disease or to mild forms of sepsis may exist for years before it is recognized or gives the patient sufficient trouble to cause her to seek the relief afforded by a local examination; and a very large proportion of cases are not diagnosed, the symptoms being attributed to displacements, cellulitis, etc.

Then it must not be forgotten that the effect of a given local disease is not the same in different individuals; that is, mild salpingitis in a healthy individual with an even and well-balanced nervous system will not cause the same digestive and other functional disturbances which it would cause in a delicate, sensitive woman with an ill-balanced and hyperæsthetic nervous system.

Very often the local disease is subacute, and remains more or less latent in a limited peritoneal sac of adhesions. Besides, occupation or habits of life greatly modify the effects of a disease. Among the well-to-do a woman with a chronic salpingitis, by leading a very quiet life and avoiding standing or exertion during periods of congestion, may get on without great suffering, and deliberately decide not to resort to an operation for a radical cure. But a poor working-girl, who stands behind a counter eight or ten hours a day, must have help or she will break down, and the woman who does washing and takes care of her children soon succumbs.

There are women who have an acute attack of the disease accompanied by local peritonitis, and keep in bed till it subsides, who then enjoy comparative comfort for weeks or months, or even years, before another attack renders them helpless, and who again get up and attend to their duties. But follow these cases, and sooner or later you will see many of them end with general peritonitis and death, or with a fistulous opening in the rectum or vagina or in some other part of the pelvis. It is surprising what some women can endure. Only recently I operated on a young woman with the following history: About three years ago she came to New York and entered the Bellevue Training School for Nurses. At the end of a year she was sent away, against her wishes, on account of physical disability to do the work assigned her. On examination I found unmistakable objective symptoms of salpingitis. On the right side was an indurated mass in the broad ligament. I advised operation for its removal as the only means of cure, and predicted that the mass, if not removed, would sooner or later break down. She refused to submit to the operation, and went to one of our general hospitals, but, not being able to endure the treatment ordered for her, left. Last summer, while at home for a rest, she had severe local pains and fever. The case was diagnosed as typhoid fever, for which she was treated many weeks. In the fall she returned to New York, and, although still sick, she sought occupation as a nurse. After filling this position for six months, she came to me and said she could endure her sufferings no longer. She gave me a clear history of the bursting of a pelvic abscess nearly a year before and of frequent attacks ever since of purulent diarrhœa. On examination I found a hard, rounded mass on the right side attached to the uterus and simulating a fibroid tumor the size of the fist. My diagnosis was a chronic abscess around the tube and ovary, opening high up in the rectum. She was put to bed, and on examination of the stools the diagnosis was confirmed. The opening in the rectum could not be reached, and, as the tumor did not present fairly in Douglas' pouch, and was drawn by adhesions high up into the pelvis, I decided to open the abdomen, verify my diagnosis, and at the same time find out whether a trocar could be safely passed into the old abscess by the vagina; for I knew that to open the abscess within the peritoneum and leave the hole in the rectum, or to try to close it, would be almost certain to kill her. When the abdomen was opened the sac of the abscess was covered with adherent intestines and the whole pelvis was a mass of adherent organs. I soon separated them sufficiently to determine beyond question that the abscess communicated with the rectum, and that well up in Douglas' pouch I could puncture and drain by the vagina. This was done, and about four ounces of fetid, dirty pus were evacuated. The cavity was washed out, the opening was dilated, and a

drainage-tube was introduced. If this woman had had money enough to live on, she would never have submitted to the operation. I have now three other patients under my care in whom the symptoms of an abscess opening and discharging at intervals into the rectum are precisely the same, but they will not submit to an operation.

In severe cases during the acute stage complete rest in bed is the proper treatment; anodynes and counter-irritants may be used. When the active symptoms subside, I apply thin pledgets of cotton, saturated with a mixture of boroglyceride one part and pure glycerin fifteen parts, to the cervix and vagina; these are left in place twenty-four hours, then removed and a douche of hot water given. On the third day another pledget is put in, and this is kept in place for a week or two. Later a solution of one part boroglyceride, one of alum, and fourteen of pure glycerin is used to saturate the cotton in place of the first mixture. Some patients will not tolerate even this mild treatment; when it is borne, after a week or so the solution softens the products of inflammation and renders the uterus more movable, and enables one to make a more accurate diagnosis. It improves the circulation, and often gives, for the time, more or less complete relief to all the local symptoms. With this simple local treatment close attention should be paid to the general health and to the condition of digestion. The bowels especially should be carefully regulated, for impacted fecal matter in the lower end of the descending colon or rectum may materially add to the pain and aggravate the disease by pressing directly on the left broad ligament.

In patients suffering from dysmenorrhœa it will be safe to sound the uterus if we succeed in getting it movable, so that it can be pulled pretty well down with the tenaculum without causing much pain, and the canal, if it is contracted and hyperæsthetic, should be gently dilated, so as to secure good drainage and proper applications to the mucous lining. If excessive hemorrhage has existed, and if it is not corrected by tincture of cannabis indica, twenty drops given twice a day, it will be safe, if the uterus can be made movable by the use of the medicated pledgets, to curette it for the removal of granulations. I always adopt this treatment preparatory to operation, except where the diagnosis is plain and indicates immediate action to prevent rupture of a painful cyst or to prevent septic poison and death after rupture. In these cases I resort at once to the operation for removal, unless I feel assured that the contents of the pelvic abscess are virulently poisonous. Then, if practicable, I endeavor first to draw off the pus by way of the vagina. If it is necessary to determine whether this can be safely done, I open the abdomen, as I have done for several years past, and determine just where to make my puncture in the vagina. If the tumor happens to be adherent to the anterior abdominal wall, as I have found

in two cases, the one near Poupart's ligament, the other above the crest of the ilium to one side, I open in the groin. Usually I have closed the exploratory incision in the abdominal wall before making an opening in the vagina to evacuate and drain off the pus.

In opening abscesses by the vagina and draining them, I endeavor to find a presenting fluctuating point in Douglas' pouch as near as possible posterior to the os uteri. If no such point can be plainly made out, I prefer, rather than run the risk of puncturing at any other point in the vagina, to make an exploratory incision into the abdomen in the median line, and then determine the safest point to puncture. By this means we can avoid puncturing an intestine, the ureters, or a large pelvic blood-vessel. If we puncture to either side of the uterus, we must go through the whole thickness of the broad ligament, and run great risk of cutting a ureter or large vessel. If we puncture in front of the uterus, we are almost certain to go through the bladder. Having determined that it is best to puncture and drain by the vagina, with a long curved trocar I puncture the abscess; then the canula is withdrawn and the pus evacuated, and the cavity repeatedly washed out with 1 : 5000 sublimate solution. With the canula still in place I turn the patient on her side in Sims' position and introduce Sims' speculum in the vagina; then I pass through the canula a small probe without a handle, and slip it out over the probe, keeping the probe in as a guide. With a steel uterine dilator I dilate the opening, so that I can pass my finger into the abscess. By means of a pair of slender forceps I carry into the abscess a large-sized drainage-tube of soft rubber; in this way I avoid the use of a knife and the risk of cutting a blood-vessel or the ureter. To prevent the tube from slipping or being forced out as the cavity of the abscess contracts, I pass a silver suture through the posterior lip of the cervix and the wall of the drainage-tube, and tie the tube to the cervix with silver wire. The cavity is washed out with an antiseptic solution, as indicated by the discharge and temperature of the patient. As the discharge diminishes the large tube is replaced by a smaller one and the opening kept dilated until all drainage ceases.

I would not advise this treatment except in those cases where abdominal section is not allowed, or where there seems to be only one large cyst such as is sometimes found following a broken-down hæmatocele pointing in Douglas' pouch, or where we are sure to find actively septic pus. In most cases the abscess or distended tube is too small to be reached safely in this way. If, after opening the abdomen and finding a large pus-cavity, I wish to make a counter-opening through the vagina, I make a small opening with a trocar or pointed forceps, and then dilate it with dilators. In the case of a large pelvic abscess pointing toward Poupart's ligament I open by an incision in the groin,

and would not enter the peritoneal cavity above the abscess except to secure complete removal or to get perfect drainage or make sure just where to open.

When diseased tubes are plainly made out, and the patient is bedridden or suffers to such an extent that after being clearly informed as to the effect and danger of the operation she consents to its performance, then we consider complete removal of both tubes and ovaries, if both sides are affected, to be justifiable. By softening the indurated tissue and improving the circulation of the pelvis we can help, but not cure. By atrophy and absorption Nature may cure, but chronic invalidism usually comes on before the cure has been effected, or instead of the usual attack of local peritonitis the bursting of a distended tube may cause general peritonitis and death. The early removal of a diseased tube could have prevented many cases of so-called idiopathic peritonitis. Even after the peritonitis set in the patient might have been saved by a bold surgeon.

After having resorted to the preparatory treatment with glycerin-and-alum pledgets as described, and having decided that an operation is proper, I have the patient's bowels well emptied. I put her on pancreatized milk diet, with very little other plain food, for three or four days previously to the operation. The object is to remove all impacted fecal matter and to lessen the amount of gas in the intestines, which, by crowding around the pelvic organs and out through the incision in the abdominal wall, may be very troublesome. Thus, there will be little or no gas in the intestines, which will be found to be like slippery ribbons. On the day of the operation the bowels should be well moved, but not excessively.

In surgical practice I would place cleanliness first, drainage second, rest third, and antiseptics fourth. If we could be perfect in cleanliness —for prevention is better than cure—antiseptics would be useless. Some of us are willing to be considered fallible, and for this reason use antiseptics. Before Lister plainly showed the necessity of cleanliness and the value of antiseptics, few surgeons knew how important cleanliness was to success in surgery. Who, prior to the teachings of that eminent surgeon, spent hours in cleaning instruments and sponges, and placed over wounds a thick layer of absorbent cotton-wool? Cotton-wool affords the best protection against the passage of germs and their spores; and he who uses it for dressing wounds carries out the principles taught by Lister.

Before operating my patient is thoroughly bathed and clean clothing for her body and bed ordered. The abdomen is shaved down to the pubic bone and well washed with soap and water and alcohol, and, before the skin is cut, well washed with a solution of 1 : 3000 acid solution of mercuric bichloride. All the instruments are kept in solutions

of 1 : 20 No. 1 Calvert's carbolic acid, and sponges in a 1 : 5000 acid solution of mercuric bichloride. Two assistants only are needed—the one to give ether, and the other to stand opposite the operator and apply the sponge—for of course the danger of infection is in proportion to the number of persons who aid the surgeon. Thorough ablution and the use of the solution of bichloride are enjoined on all assistants.

The patient being etherized, the bladder is emptied and the abdominal incision is made just above the pubes. The length of the incision in the skin is from two and a half to three inches, according to the amount of fat in the abdominal walls, the opening in the peritoneum being only large enough to allow the free use of the index and middle finger at the same time. This opening is rarely made larger, unless the distended tube or ovary is of such a size as to make it necessary to do so to extract it. A larger opening adds to the risk of septic poisoning and of ventral hernia. When ovarian and other large tumors are removed the abdominal walls are relaxed, there is less tension on the sutures, and perfect union is more readily secured than in those cases in which the intra-abdominal pressure is normal.

When the subperitoneal fat is reached it may be troublesome to get through it, for there is no distended tumor directly underneath it to keep away the intestines and hold the many layers of the peritoneum together. Where gas is in the intestines this difficulty is increased. The incision through the peritoneum is made by pinching it up with two pointed forceps and cutting through it between them. When the omentum is free from adhesions it can be pushed up as one would push up the end of an apron. When it is adherent, as it often is, to the broad ligament and anterior wall or top of the uterus, it cannot easily be separated by pulling it from below upward, but, by passing the index and middle finger well to one side and getting them underneath, and then separating the adhesions, many formidable-looking cases can be easily managed. As the adhesions are separated they should be lifted through the opening and any bleeding points tied. The principal vessels in these adhesions come from those of the omentum, and not from the pelvic organ; therefore the end of the omentum is the part to be tied. If the adhesions are strong and vascular, as they may be in those cases in which there have been repeated attacks of local peritonitis, the omental adhesion can be tied off—tied first as low as possible, and then a little higher—and cut between the ligatures. By pulling the sides of the abdominal opening laterally with retractors we can do this without enlarging the opening in most cases. In handling and tying the omentum care should be taken not to split or tear it, for it will invariably bleed in the angle of the tear, and may be very troublesome. Where the uterus is retroverted the removal of the omentum,

as a rule, frees the anterior part of the fundus and the anterior face of the broad ligaments; often the small intestines will have to be separated, but they are generally not firmly adherent. The next step is to elevate the uterus by placing the fingers behind it. The back of the fundus may be adherent, but, as a rule, it is free and is held back by the twisted and rolled-up state of the broad ligament. The ovary will be found folded under the tube and broad ligament, and to get it up we must either go down through the broad ligament or unroll it. I have seen the former done several times, with the result of adding greatly to the length of the operation, and of necessitating tearing or tying off the outer attachments of the broad ligament before the tube can be detached and tied off with the ovary. Now, by putting both fingers directly behind the uterus and running them laterally, guided by the Fallopian tubes as they are given off from the uterus, and gradually separating the adhesions and unrolling till we get under the ovary, the tube and ovary can be easily freed in the worst cases. Where the adhesions are very firm, an assistant's finger in the vagina may be a useful guide, for in scratching loose the adhesions the ureter may be lifted up and the sigmoid flexure or rectum may be torn up, for it may be adherent to the tube or ovary on the left side. When both sides are adherent it may be well to lift them up before tying either, although in some cases where the bleeding is free it may be better to tie the one first lifted up. In many cases I have found the tissues so degenerated that my ligature cut through, and I was compelled to enlarge the abdominal opening and tie the arteries after picking them up with forceps. Where the tissues are frail and the ligatures are inclined to cut easily, it is safer to remove the former and tie the arteries separately, of which two or three will usually be found. Where the broad ligament is much enlarged we may tie with two ligatures—the double including the ovarian ligament and the tube within half an inch of the fundus, the single tying off the outer end of the broad ligament. The pampiniform plexus may give trouble; I have seen it so degenerated as to fall to pieces while being tied. I use firmly-twisted Chinese silk, and prefer to pass a double thread with a needle somewhat like an aneurism-needle, with a sharper point and longer handle than those generally found in the shops.

In tying, except in cases where one double ligature will suffice, I do not use Mr. Tait's Staffordshire knot, but cross and interlock the two loops of all double ligatures, and, so far, have never had a ligature slip after the operation. After tying, before cutting off the tube and ovary, I catch the tissue with pressure-forceps close to the ligature, so that I can cut off the ligatures and not be tempted to use them to lift up the pedicle when once tied. Besides enabling me to keep the pedicle in sight, these forceps act as guides in cutting away

the tube and ovary. Often the ovarian ligament is so short that it is not easy to get a satisfactory stump left and cut off all the ovary. With a Paquelin cautery I touch any suppurating end of a tube in the stump or ovarian tissue that may be left on it after tying. The tubes and ovaries of both sides should be removed if there be the least sign of salpingitis, but in several cases I have found only the left side affected, the right tube and ovary being free from even a single adhesion; and I removed only those of the diseased side.

The cavity should be thoroughly dried with sponges, and time given for hemorrhage to make itself manifest before the wound is closed. Where there are extensive adhesions, or any pus-cavity has been disturbed, the abdomen should be flooded and washed out with water at 110° Fahr. For this purpose I prefer a gallon fountain-syringe with a large tube which is carried well to the bottom of the pelvis, so as to wash up clots, etc.; it does this much better than does pouring in water from a pitcher. In all such cases as require washing out a drainage-tube should be inserted. I prefer a small-sized tube of glass with some small holes in the sides, and open ends, and use a catheter attached to an ordinary syringe for emptying the tube when needed. If there is no discharge, I remove the large tube in twenty-four hours and slip a smaller glass tube in its place, when the opening soon fills up from the bottom. In introducing the sutures in the abdominal wall, I am careful to secure not only perfect coaptation of the peritoneal coats, but also of the deep and thick abdominal fascia, for if good union of the latter is secured the risk of ventral hernia is much lessened. It is this tissue, and not the muscles, which are longitudinal, that gives strength to the abdominal wall in the median line. For forty-eight hours nothing is allowed to be taken except teaspoonful doses of hot water or weak tea. Enough morphine is used to prevent great pain and restlessness, but as a rule it is not needed. An enema is usually given on the third day to move the bowels, and sutures are removed on the sixth day. If indicated by the pulse or by great thirst, nutritive enemata are given every four hours. Either medium silk or silver wire is used in sutures for the abdominal walls. If the abdominal walls are thick from adipose tissue, the peritoneum, as a rule, will be found tense, and to close it properly will require more than usual care. In such a case, after passing from three to six silk sutures through the skin, fascia, and peritoneum, the peritoneum should be carefully closed with catgut sutures, and the fascia or conjoined tendon of the transverse muscles be separately closed in the same way. Then the first silk sutures should be closed, leaving room between them, in two or more spaces, for short drainage-tubes, placed upright so as to drain the adipose tissue between the fascia and the skin. Or, if the walls are closed by silk sutures in the usual way, the skin, a little to the side of

the cut, should be punctured, so as to give vent to the grease that is certain to escape from the more or less bruised adipose tissue. I have seen mural abscesses caused by this free fat, which might enter the peritoneum and augment the trouble. After sewing up and cleaning the wound it should be freely sprinkled with iodoform and covered with a layer of absorbent cotton that has been squeezed out in 1 : 5000 acid solution of mercuric bichloride, and over this with several layers more of dry absorbent cotton, so that the whole abdomen will be evenly compressed when the adhesive straps and band are put on. Over the cotton a folded towel and mackintosh are placed, and firmly compressed by adhesive straps and a bandage. Except where a drainage-tube is inserted, this dressing can remain until the sixth day, unless oozing appears through it or a rise of temperature takes place, indicating septic poisoning, when the wound should be examined. In cases with extensive adhesions or in pyosalpinx, especially where the tissues are infiltrated, we must expect during the first two or three days a moderate rise of temperature, caused by the small amount of septic material left in the pelvis; but this is readily absorbed, and the local peritonitis caused by it soon subsides.

When the patient fails to rally well, and has a temperature at or below the normal, or where all symptoms are favorable and the temperature is low until the afternoon of the third or until the fourth day, the temperature then making a steady rise, there is, as a rule, a fatal case of septicæmia to deal with, death usually occurring within two or three days. Sometimes a case begins as a local peritonitis, which gradually spreads to a general peritonitis, with vomiting and death. I think the proper name for such a case is septicæmia.

Since I have learned how to wash the abdominal cavity clean during an operation, many formidable cases have recovered without any serious symptoms, often with a normal pulse and temperature. In a paper read before the Medical Society of the State of New York, Feb. 2, 1887, I not only advocated the use of hot water for washing out the peritoneal cavity and as an efficient hæmostatic for oozing points too numerous and small to tie, but also maintained *that in a prolonged operation, and immediately after it, free irrigation of the peritoneal cavity with water at 110° to 115° is a powerful and efficient agent in lessening, if not entirely preventing, the effects of shock.* The water should have a temperature of 110° to 120°, or it may cause shock. I have now used it frequently for two years past, and it certainly is a powerful stimulant, especially if forced well up near the diaphragm. When used early it will prevent the shock, but when shock has lasted some time it is doubtful whether it can be used with success, for the opening of the peritoneum adds to the danger. Sometimes it is efficient when injected through the drainage-tube, but I would not advise this many hours after opera-

tion, for shock that does not soon show itself is apt to be due to hemorrhage caused by the slipping of a ligature.

In that paper I also advocated the use of enemata and purgatives after laparotomy, for the relief of the tympanites and vomiting supposed to be due to peritonitis, instead of the free use of opium, at that time almost universally resorted to. Previous to this purgatives had been used in septic peritonitis, and Tait had found them beneficial after laparotomy, but the theory was that they carried off the septic poison. I took the ground that it is probable that in many cases the persistent and exhausting vomiting may be the direct result of obstruction caused by peritoneal exudations twisting or constricting the intestines.

For a long time I have seriously doubted the existence of septic peritonitis in the beginning of some cases in which the vomiting preceded the rise of temperature and other symptoms of sepsis. Death in these cases I believe to be due to intestinal obstruction. The obstruction and the vomiting overcome the reparative process. A septic condition ensues, with fatal results, before the obstruction has reached the stage of slough. At any rate, I have found it best always to move the bowels, whenever indicated by tympanites or vomiting, even during the first twenty-four hours after operation.

Vomiting resulting from ether is likely to be preceded by marked nausea, and comes on immediately or within a few hours after the operation, and is of unusual violence; while that from obstruction is passive and somewhat like eructations. The quantity vomited is large, is at first brownish-colored, and soon is attended with extreme exhaustion and marked tympanites.

The opium treatment for peritonitis, so ably advocated by the late Dr. A. Clark, may be the best plan for limiting the disease at its commencement, and the resort to it at this time may account for its success in certain cases; but I am certain that it is not best suited for cases of septic peritonitis following laparotomy. When the pain is very intense or there is great restlessness, I may use just sufficient opium or morphine to give a rest, but rarely repeat the medicine more than once or twice. As soon as tympanites or eructive vomiting begins, I move the bowels by turpentine enemata, or, if I fail to get a full movement, I give a Seidlitz powder and Epsom salts or an ox-gall enema.

For some years past I have been in the habit of keeping up my patient's strength by stimulating and nutritive enemata, given every four hours after laparotomy, when indicated by thirst or the pulse, so as to avoid disturbing the stomach for at least thirty-six or forty-eight hours. The beneficial results of this treatment were soon evident, and it occurred to me last year that large hot saline enemata of the sarcopeptones or beef-tea given *during the operation* might through rapid absorption prevent shock by performing the functions of the blood

lost by hemorrhage. In October, 1887, I reported to the New York Obstetrical Society two cases in which I had used them for this purpose. One of these was a case of hysterectomy for a large vascular fibroma. Several large venous sinuses were torn in lifting out the tumor; and as this had a double source of blood-supply—one from the uterus, the other from enormously distended vessels passing into the tumor from the omentum—at least three pints of blood were lost before both pedicles could be secured. Immediately an eight-ounce salt solution of beef-peptones was injected into the rectum while I was operating, and four or more similar injections were given every twenty minutes. All were retained. Although there were at first marked symptoms of shock, the patient quickly rallied, and three hours later all signs of it had disappeared. The enemata were repeated at longer intervals, and the patient made a good recovery.

The hot saline injections were given not merely to stimulate reaction or to nourish the patient, but to take the place of the blood which was lost. It is surprising how absorbent the rectum is under such conditions.

It is of importance to give the enemata when the blood has just been lost, and to repeat them often enough to keep the rectum full until the loss is made up.

The Results of Operations for Removal of the Uterine Appendages for Disease.

Up to January 1, 1888, I operated for the removal of the appendages 115 times, with 6 deaths. In the first 25 there were 3 deaths; in the second 25 there were 2 deaths; in the third 25 there were no deaths; in the fourth 25 there were no deaths; and I had a run of 61 consecutive operations without a death. It seems to me that it is thus proved that this is not a very dangerous operation, as far as loss of life is concerned.

Now as to the results on the health and life of the patient. There is no reasonable doubt that pyosalpinx is the only means by which real relief can be had in the great majority of cases, and that it actually saves lives. The number of women who have died from an extension of local peritonitis due to it is much greater than is generally known.

In hydrosalpinx the operation is not imperatively needed, but frequently removal of the uterine appendages relieves the pain which it produces. It is nearly always bilateral, and, as one tube only usually lies low enough to be tapped by the vagina, this operation should be discarded. In catarrhal inflammation, where the tubes are occluded, disturbance to functions and fixation of the uterus by adhesions in the

broad ligament will in time necessitate removal of the appendages. Where there is no occlusion, except in rare cases of hydatids of the tubes, the operation should be resorted to only when there is disease of the ovaries or uterus. Hæmatosalpinx, uncomplicated by disease of the tubes or ovaries, may not, unless the hemorrhage is the result of disease, require removal.

If, in tubal pregnancy, rupture takes place, removal is the best treatment. If it is complicated by disease, hemorrhage, or inflammation, laparotomy is frequently the only means of saving life; and, if uncomplicated, the operation for removal is attended with little danger, and secures us against further complications.

The removal of the appendages for the purpose of stopping the menstrual function[1] is justifiable in many cases of fibromata of the uterus, for it will nearly always stop their further development. Not infrequently the severe pains supposed to be due to the fibroids are caused by pyosalpinx. Submucous fibromata are not always cured by removing the appendages if these are diseased or adherent, for occasionally in a case of this kind bleeding and increase in size will be manifested. I make it a rule to curette the lining membrane of the uterus prior to the operation.

I know of no uterine disease except fibromata, and perhaps endometritis, which justifies removal of the appendages when normal. Hemorrhage, when due to disease of the uterus, can be stopped by adequate curetting with a good steel instrument, although the little copper instrument so highly recommended will often fail to secure this result.

Dysmenorrhœa is due to uterine disease, and in almost all cases can be readily cured by either dilatation or divulsion; the healthy appendages should never be removed when the dysmenorrhœa is uncomplicated.

Where there is atrophy and degeneration of the uterus with perversion of all the functions, and where menstruation makes life miserable, removal of the appendages is justifiable should all other means have failed to give relief; but it is doubtful whether the characteristic cystic ovaries nearly always found in such cases can be called normal. Dilatation, stimulating local treatment, and proper attention to the general condition may make the patient strong and relatively healthy. When she is over thirty years of age and bedridden, the operation can do little harm, and certainly in some cases affords the only attainable relief.

In epilepsy or so-called hystero-epilepsy the operation may be temporarily beneficial, but in three out of four cases it is of no permanent service. In this disorder, unless I can detect signs of disease either of the ovaries or the tubes, I will not operate.

[1] See article on Battey's operation.

In mental diseases which seem to be connected with functional disturbance of the tubes and ovaries, I will not operate unless the touch indicates disease of the tubes or the ovaries, such as adhesions, decided enlargement, or fixation. In a given number of cases the operation is for a time followed by marked mental depression. Subinvolution of the uterus after labor and abortion is not infrequently associated with serious mental symptoms which can be relieved by restoring the uterus to a normal state. The fact that the generative functions are disturbed or abnormal does not imply that they are diseased.

About 10 per cent. of the patients operated upon continue to menstruate after removal of the appendages, and I know of two cases in which, after operation, menstruation ceased for a year and then came on and became regular. After close investigation I have been led to conclude that this occurs in those cases where the adhesions are great, especially where the inflammation contracts and shortens the ovarian ligament, and makes it difficult so to remove the ovary that more or less of it shall not remain in the stump, or where the adhesions are such that it is necessary to tear it into pieces to remove it, usually a small part being left on the floor of the pelvis or on the broad ligament. I do not know of an instance in which menstruation returned and remained regular where the ovaries and tubes, being entirely free from adhesions, were removed close to the uterus.

I suppose that if the tubes and ovaries were removed before puberty the character and nature of the woman would be greatly changed; but when removed at maturity they do not appear to have any marked effect on her appearance, character, or temperament.

Ventral hernia following laparotomy for removal of the appendages is by no means rare, as I pointed out in a paper on this subject.[1] Most operators overlook the fact that the deep fascia which divides so as to form the sheath of the recti muscles, and which unites in the median line to form the linea alba, is in reality the tendon of the transverse abdominal muscles—that it is this fascia, and not the recti muscles, which gives the abdominal walls their transverse strength. Unless special care is taken to secure exact apposition of the edges of this divided fascia the muscles or the adipose tissue will intervene, and hernia will result, especially if a large-sized drainage-tube has been used.

In cases of diseased tubes the intra-abdominal pressure tends to separate the edges of the fascia, especially if the woman is fat and if the liability to hernia is much greater than in ordinary laparotomy for cystoma. It is the custom among operators, following the advice of Tait, to have closely-fitting trusses worn for a year after laparotomy. These trusses will often prevent the early appearance of hernia; but

[1] "Ventral Hernia caused by Laparotomy," *Amer. Journ. Obst.*, vol. xix., Jan., 1887.

if the fascia has not been properly closed, the old scar begins to yield and a troublesome hernia to form.

Where removal of the ovaries is complete, and all of the tubes to within half an inch of the uterus have been cut away, bimanual examination of the patients generally reveals after a few months no sign of the old "thickening in the broad ligament;" the so-called cellulitis is gone, the uterus is movable, and gradually becomes contracted. It is often found retroverted. Unless menstruation and an old endometritis continue, there will be no symptoms attributable to retroversion. As in the case of other women, we may find after the menopause more or less contraction and hyperæsthesia about the ostium vaginæ, which is probably due to atrophy and degeneration.

Many patients, especially those who were operated upon for chronic salpingitis, and in whom for years abnormal congestion and dilatation of the blood-vessels of the pelvis had been manifested, complain of pelvic pains and dragging sensations on standing, and at times seem to have a renewal of the old trouble. These attacks will be found to occur at intervals, and are probably due to an effort of nature to keep up the habit of menstruation. If the ovaries have been partially left, menstruation is almost certain to continue, and it may, if endometritis still exist, cause dysmenorrhœa and other painful symptoms. For this reason it is important to remove every particle of ovarian tissue, and never, on account of adhesions, to perform an incomplete operation. The operator must bear in mind the fact that the ovaries and the ends of the tubes can in every case be removed, no matter how deeply or densely imbedded in adhesions; first, by separating the adherent omentum and covering of the adherent intestines; secondly, by loosening the fundus uteri and by *unrolling* the broad ligament, which in deeply-imbedded cases nearly always folds backward over the prolapsed ovary; thirdly, by means of a strong finger-nail enucleating the ovary from its bed of adhesions to the floor of the pelvis and posterior and lower surface of the broad ligament. There are two important things to avoid; first, tearing of the intestine, especially near the sigmoid flexure; second, leaving a part of the pyogenic sac of an abscess of the ovary or tube. Hemorrhage ceases the moment the ligature is properly tied about the pedicle, unless the intestinal wall or the omentum or the uterine wall has been torn; for the adhesions invariably get their blood-supply either from the tube, ovary, or that part of the broad ligament which should be included in tying the pedicle, or from the omental vessels. I have never yet found it necessary to perform an incomplete operation. It is often the case that we cannot readily get a good pedicle and be able safely to cut away from the stump all of the tube or ovary; small pieces of ovarian tissue when densely adherent may be left unnoticed.

The most unsatisfactory cases are those which are associated with reflex symptoms. Hysteria and neuralgias are often but little affected by the operation.

I have lately noticed in several cases which I operated upon one, two, and three years ago that indurations, and even cystic tumors as large as oranges, have appeared in the broad ligaments near the pedicles, although I had done at the time what I considered a complete operation, as shown by the specimens. Menstruation has gone on very much in the same way as before the operation. In studying them I have found that they belong to two classes. In the one class, which is the more common, the adhesions are dense and strong and the ovaries have at the time of the operation several large cysts, often as large as oranges, which could not be removed except by bursting or by tearing them out—a part of the walls being practically so adherent as to make it impossible to know when all had been stripped off from the different organs. In some the cysts were so thin and numerous as strongly to resemble hydatids. In the second class the recurrent thickening is more solid and appears to be an enlargement of the stump of the tube near one or both sides of the uterus. I have reason to think that in two cases of the latter class lately returned for treatment the trouble is tubercular. I cannot say that the disease has reappeared or that it has continued to develop in the stump, but this seems to be the case. In many cases, especially where a drainage-tube has been used, an abscess forms around the stump of the pedicle; a sinus along the track of the drainage-tube is established, and continues to discharge pus until the ligature floats to the surface or until it is fished up with long slender forceps, as I have frequently done. This abscess is due either to the use of septic silk in tying the pedicle or to infection of the silk by the pyogenic end of the Fallopian tube where it is cut off and is not rendered aseptic by the application of the cautery or of some antiseptic to the end of the cut surface before dropping it. It may also be due to the drainage-tube coming directly in contact with the ligature and becoming infected by suppuration around the tube.

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THE PATHOLOGY OF OVARIAN TUMORS.

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Introduction.—The uncertainty and consequent confusion which obtain in the field of ovarian pathology become evident even to the casual reader of its literature, and may easily be traced to our imperfect knowledge of the physiology of this, the most protean of glands, as well as to the fact that many questions relating to its histological structure, the solution of which is essential to our complete understanding of a most perplexing subject, are still matters of doubt and controversy. It is to be hoped, however, that the brilliant achievements of antiseptic surgery during the past two decades, resulting as they have in the establishment of ovariotomy as the most successful of all the major operations, may so stimulate research that this maze of conflicting views which now confronts the student may give place to definite and well-grounded facts. That this desirable end is capable of attainment admits of no doubt, though an appreciation of the intrinsic difficulties of the subject, as demonstrated by the experiences of the past, forbids the hope that we shall welcome this ovarian millennium in the near future.

The ovary, as we know, is developed from the comparatively flat, oblong mass of mesoblastic cells constituting the genital ridge, which lies on the mesial side of the Wolffian body. This cell-mass has a bilaminar arrangement, the outer thickened stratum of proliferating epithelium, or that facing the pleuro-peritoneal cavity of the embryo, completely covering the more deeply seated layer of modified mesoblast. As the development of the ovary progresses, the outer layer, bending in the direction of its long axis, gradually encloses the inner, till finally the latter remains exposed only at the site of the future hilum; while the outer stratum of columnar cells (germinal epithelium of Waldeyer) merges abruptly into the pavement epithelium of the peritoneum. Such an ovary is, on section, found to be made up of two parts or zones: first, a cortical or parenchymatous; second, a medullary or vascular zone. Of these zones, the former, with its layer of cylindrical epithelium and imbedded glandular structures, corresponds with the *mucosa* of a mucous

membrane; while the latter, or vascular zone, resembles the vascular *stratum submucosum*. That the ovigerms and primitive ova are derived from the germ-epithelium has been fully established by the labors of Waldeyer[1] and many others, though the precise manner in which these are enclosed in the follicles of De Graaf is still a *quæstio vexata*. The marked multiplication of the germinal cells which characterizes the earliest stages of ovarian development is attended with changes in their size and appearance, some, while still near the surface, outstripping the others in growth and coming to resemble the primordial ova. As these ovigerms and primitive ova increase in number they naturally tend to recede from the surface, and thus invade the deeper blastema or modified mesoblast, the cells of which are simultaneously developing into the connective or fibro-nuclear tissue of the future stroma. Thus a mutual intergrowth of epithelial and stromal structures ensues, resulting in the imbedding of groups or nests of ovigerms, each of which may or may not include one or more of the primordial ova developed in the layer of germ-epithelium. At first the ovigerms constituting the cell-nests are usually wellnigh uniform in appearance and size; very soon, however, one or more of the cells, continuing to develop, acquire the characteristics of ova, while the others become smaller and lose their spherical shape.

FIG. 319.

Vertical Section through the Ovary of a Human Fœtus of thirty-two weeks (Waldeyer): *a*, epithelium; *b*, primordial ova; *c*, trabeculæ of connective tissue invading the epithelial stratum; *d*, groups of epithelial cells becoming imbedded; *e*, primordial follicles lined with narrow connective-tissue cells; *f*, groups of epithelial cells already imbedded and including some larger cells (primordial ova); *g*, granular cells of His.

It is from these cell-nests of various sizes, which transform the cortical zone of the ovary in its early stages of development into a cavernous network, that the primordial follicles are formed by the continuous invasion of the vascular, spindle-celled connective tissue, each follicle containing usually but a single ovum, though occasionally two, and

[1] Wilhelm Waldeyer: *Eierstock und Ei*, Leipzig, 1870.

very rarely three, ova have been found. That the cellular lining of the Graafian follicles, the *membrana granulosa*, is formed by the smaller cells resulting from the multiplication of the germ-epithelium, and which, with the ovum, are included in the newly-formed cavity of ovarian stroma, is now pretty well established by the researches of Waldeyer, Ludwig, Balfour, and others; though, as a matter of course, dissenting voices are heard here likewise. Thus, Foulis, struck by the resemblance which the flattened, spindle-shaped elements lining the smallest ovisacs bear to the cells of the ovarian stroma, was led to ascribe their origin to the differentiation of the latter, rather than to the germinal epithelium—an assumption apparently at variance with existing doctrines, since it implies the direct metamorphosis of connective-tissue elements into epithelial cells, and thus combats the dogma that epithelium can arise from epithelium alone. The importance of Foulis' view, however, and the advisability of early settling its truth or falsity, become evident when we consider that by it a purely stromal origin for ovarian cysts is admitted, there being no reason to suppose that under certain morbid influences such follicular cells may not form, to develop later into a cystic tumor. While admitting with Waldeyer the derivation of the ova from the germinal epithelium, Kölliker,[1] seconded by Rouget, refers the origin of this granular-cell lining of the follicles to the epithelium of the peculiar tortuous and branched medullary cords and tubules first observed by Waldeyer, which persist for a time in the ovarian hilum as vestiges of the Wolffian body. When the ovaries of some of the lower animals are examined, it is found that the germ-epithelium apparently invades the subjacent stroma in the form of long tubular structures, the outer ends of which are continuous with the epithelial covering of the ovary, while the inner or blind extremities lie at various depths in the cortex. The studies of Valentin,[2] the first to direct attention to this subject, were afterward supplemented by the more elaborate investigations of Pflüger,[3] according to which each of these tubiform masses of cells is surrounded by a *membrana propria*,[4] and contains within its lumen ova, generally in rows. In the human ovary these long, branched, anastomosing cords or tubes of rounded or polyhedral cells, the so-called "tubes of Pflüger," are present from about the ninth month of fœtal life to shortly after birth, evidently replacing, in part at least, the spherical clusters or nests of imbedded cells which had imparted to the gland in its earlier stages the exquisitely cavernous structure to which we have already

[1] *Entwickelungsgeschichte des Menschen und der höheren Thiere*, Leipzig, 1884.

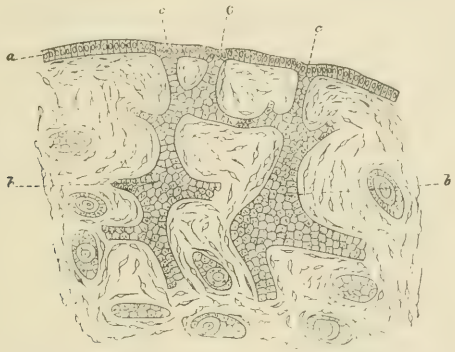
[2] G. Valentin: "Ueber die Entwicklung der Follikel in dem Eierstock der Säugethiere," *Müller's Arch. f. Anat. u. Phys.*, 1838, S. 526.

[3] E. Pflüger: *Die Eierstöcke der Säugethiere und des Menschen*, Leipzig, 1863.

[4] Waldeyer denies the existence of this tubular basement membrane.

alluded. These tubes are separated by relatively wide intervals, communicate with the surface-epithelium through narrow orifices, and, below, their blind extremities are surrounded by groups of primordial follicles, as shown in Fig. 320.

Fig. 320.



Vertical Section through the Ovary of a Newborn Child (Waldeyer): *a*, germinal epithelium; *b*, Pflüger's tubes, connecting with the epithelial covering of the gland at *c*.

This secondary formation of the tubes of Pflüger from the cell-nests of the zona parenchymatosa is attributed by Waldeyer to the irregular growth of the interstitial connective tissue, whereby numbers of communicating spherical collections of ovigerms are converted into the tubular structures, which in some instances may likewise be separated from the surface covering of germinal epithelium by the encroachments of the stroma. Though Pflüger's tubes have been found at various ages, even as late as the seventy-fifth year, it is probable that, as a rule, they disappear soon after birth, their subsequent appearance being oftentimes due to the persistence of the fœtal structures, the normal conversion into follicles having failed to take place. Ordinarily, however, the primitive ovisacs are formed from the tubes of Pflüger, just as from the cell-nests, by the constricting growth and proliferation of the fibro-nuclear connective tissue; and, inasmuch as this stromal development is most marked in the vicinity of the vascular zone, successive portions of the lower ends of the tubes, each with its enclosed ovum, are thus separated. Though these tubes of Pflüger play a very important rôle in the histogenesis of ovarian cysts, according to well-nigh all of the modern German pathologists and writers, and though MM. De Sinéty and Malassez of the French school, in their valuable and comparatively recent contribution to ovarian literature,[1] uphold the existence of these structures by basing their theories largely upon them, still, professional opinion, particularly in England and in our own

[1] "Sur la Structure, l'Origine, et la Développement des Kystes de l'Ovaire." *Arch. de Phys.*, 1878, vols. vi. and vii.

country, is apparently indisposed to indorse the views of Valentin, Pflüger, and Waldeyer regarding this point. "In the development of the ovary," says Foulis,[1] "small and large groups of the germ-epithelium cells become gradually imbedded in the ever-advancing stroma. Germ-epithelial cells do not grow downward into the substance of the ovary: the ovarian stroma constantly grows outward, surrounding and imbedding certain of the germ-epithelial cells. As these latter increase in size, and as the stroma thickens around them, the whole ovary becomes enlarged. Pflüger's tubes in the kitten's ovary have no existence as such, but are appearances produced by long groups of germ-epithelial cells, many of which groups are not completely cut off from the germ-epithelial layer by the young ovarian stroma. Such groups of germ-epithelial cells in various forms are met with in all ovaries, but have no importance whatever as tubular structures. In the human child's ovary numerous furrows or clefts between irregularities of the surface are met with. Sections through these furrows and clefts produce the appearance as if the germ-epithelium (pseudo-epithelium, Balfour) passed downward into the ovary in the form of tubular open pits, as was described by Waldeyer and his predecessors. No real tubular structures, from which Graafian follicles are formed, exist in the mammalian ovary at any stage of its development. Graafian follicles are formed only in one way from the beginning of the ovary to the end of its existence. According to Balfour,[2] the tubes of Pflüger are simply trabeculæ of germinal epithelium formed from the parenchyma by stromal ingrowths; while Doran[3] regards the term as one applied to what is merely an appearance, the so-called tubes representing simply the fortuitous grouping here and there in the ovarian stroma of follicles in rows. Tait, on the other hand, denies the existence of these tubes in the cortex, declares that they appear only in the ovarian hilum, and would have us believe them identical with the tubular remains of the Wolffian structures and quite independent of the germinal epithelium."[4]

This conflict of opinion concerning the nature, origin, and development of the various constituents of the ovarian parenchyma is unhappily not confined to the glandular or productive portion of the organ, but extends to some of the stromal tissues as well; and, in order that the reader may be better prepared to appreciate the diverse views advanced in explanation of the various pathological processes about to be considered, it will perhaps be well to include here a brief con-

[1] "The Development of the Ovary," *Journ. Anat. and Phys.*, vol. xiii. pt. 3.

[2] "On the Structure and Development of the Vertebrate Ovary," *Quar. Journ. of Micros. Science*, 1878, vol. xviii.

[3] *Tumors of the Ovary, Fallopian Tube, and Broad Ligament*, London, 1884.

[4] *Vide* Tait on *Diseases of the Ovaries*, 4th Amer. ed., pp. 16 and 157.

sideration of these desmoid structures and of their mooted interpretation.

Aside from the epithelium and the follicles composing the parenchyma of the ovary, we find the texture of the organ made up of connective tissue, smooth muscular and elastic fibres, through which ramify the blood-vessels, nerves, and lymphatics. The bulk of the ovarian stroma, however, is made up of connective tissue, in which are found large numbers of spindle-shaped cells, besides others of a polyhedral and round form. The round cells are largely the so-called wandering cells or leucocytes, though some doubtless are of the connective-tissue variety; while those of an irregular or polyhedral shape are of Wolffian origin, being the analogues of the interstitial cells found in the intertubular substance of the testicle. Considerable diversity of opinion exists, on the other hand, respecting the spindle cells, which are found in special abundance in the vicinity of the Graafian follicles; and it is to this very uncertainty in the classification of these normal cellular constituents of the ovarian stroma that much of the present confusion in differentiating tumors of a fibrous, muscular, and sarcomatous nature may be traced. While it is conceded that the amount of muscular tissue in the stroma is by no means insignificant, its occurrence is wellnigh, if not entirely, limited to the medullary portion of the organ, where it envelops the larger blood-vessels in the form of sheaths. This is, of course, contrary to the views of Rouget, Aeby, and others, who ascribe to the smooth muscular tissue a large share in the construction of the ovarian stroma, both superficial and deep. It is His,[1] however, who goes farthest in this direction. This investigator would have us believe that all the fusiform cells found in the stroma of the ovary, which he includes under the name "spindle tissue," are smooth muscle-fibres, having a genetical connection with the blood-vessels, of which they represent merely the unravelled *tunicæ mediæ*. Careful study with the aid of carmine, chloride of palladium, and other chemical agents, as well as with electricity, has shown, however, that in this respect at least the opinions of the authorities just cited are untenable, inasmuch as the spindle cells deport themselves under these tests precisely as does connective tissue, of which they doubtless represent a young or embryonic type. This conclusion is strengthened by the fact that during puberty the number of fusiform cells in the deeper portion of the cortex is diminished, while the interfollicular fibrillar connective tissue undergoes a corresponding increase in amount—a condition of things best explained by assuming a direct metamorphosis of the cells into connective-tissue fibres.

[1] "Beobachtungen über den Bau des Säugethier-eierstocks," *Schultze's Arch. f. Mikros. Anat.*, Bd. i.

Of the thirty-six thousand follicles which, according to Henle's computation, exist in each ovary, none can be found even four years after the menopause.[1] What has become of them? The maturation and rupture of these vessels of De Graaf during the childbearing period accounts at best for less than 5 per cent.; and the disappearance of the balance can be explained only by assuming that they perish abortively.[2] That such is, in fact, their fate is attested by numerous evidences both ocular and microscopical, their remains being represented by the so-called *corpora fibrosa;* that is, by bright homogeneous membranes of various shapes and sizes, which may or may not include contents of a granular or filaceous nature. The white cicatricial remains due to the growth and retrograde metamorphosis of the corpora lutea, both true and false, are also termed *corpora albicantia.*

It becomes evident, from this brief review of the complex structure of the ovary, that the difficulties attending the study and interpretation of its pathological conditions are both numerous and real. We have seen that many points connected with the physiological anatomy of the organ, and having an important bearing upon its pathology, are still unsettled, still enveloped in the mists of plausible hypothesis. Nor is this all with which the student has to contend. The situation, as we know, is still further embarrassed by the fact that throughout life the ovary is normally the scene of constant alterations affecting both parenchyma and stroma, some of which seem perilously near the boundary-line between health and disease; indeed, it oftentimes becomes difficult to decide whether the normal has not really merged into the pathological. Experience teaches us, moreover, that an ovary in which not even microscopical signs of disease may be discovered is a rarity, to say the least. The organ may continue to discharge its functions properly, it is true, and yet evidences of morbid change, varying in degree and involving the glandular structures, stroma, blood-vessels, or lymphatics, will almost invariably present themselves.

In the light of these facts it no longer surprises us, for example, to find theory after theory propounded in explanation of the histogenesis of ovarian tumors, or to hear the very existence of some form of neoplasm denied by one and upheld by another: it could hardly be otherwise, for, just as from the Scriptures evidence may be adduced in support of any special religious doctrine, so even preconceived opinions concerning ovarian pathology may, seemingly at least, be upheld by phenomena observed in this glandular complex.

[1] Waldeyer: *op. cit.*, p. 30.

[2] See Creighton's interesting description of the obsolescence of follicles, *Journ. of Anat. and Phys.*, vol. xiii.

Hoc ovarium est in quo quærit sua dogmata quisque;
Invenit et pariter dogmata quisque sua.

The classification of ovarian tumors is purely arbitrary, since it may be based upon any of the various features presented by these growths, whether clinical, structural, genetic, or otherwise; and the attempt to include all these characteristics would be manifestly impossible. If we regard the tumors from a histological point of view, they may be conveniently classed under three heads: *epithelial*, *connective-tissue* or *desmoid*, and *muscular*, as follows:

- *Ovarian Tumors.*
  - Epithelial
    - Adenoma.
    - Cystoma.
      - Simple follicular.
      - Proliferating.
        - Glandular.
        - Papillary.
      - Dermoid.
    - Papilloma.
    - Carcinoma.
  - Connective-tissue or Desmoid
    - Fibroma.
    - Myxoma.
    - Enchondroma.
    - Sarcoma.
  - Muscular—Leio-myoma.

In the present article, however, it will be more convenient to consider, first, the cystic, and then the solid tumors of the ovary, reserving for final discussion the tumors of the broad ligament and pelvis, save those of the uterus and Fallopian tubes.

Follicular Cysts of the Ovary.

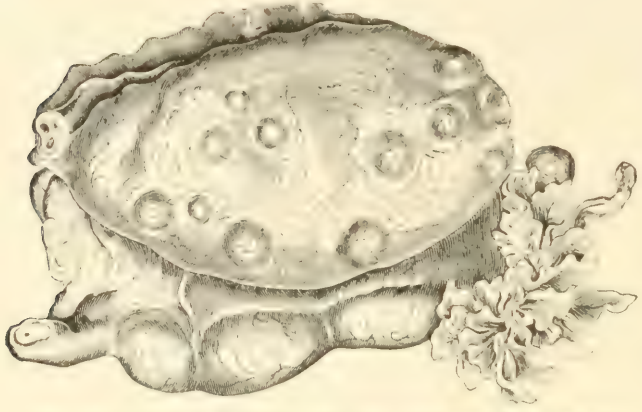
(*Hydrops follicularis*, Virchow.)

In the human ovary at birth the cellular lining of each Graafian follicle, constituting the membrana granulosa, closely invests the ovum, there being no fluid present; but at the approach of puberty a serous exudate begins to accumulate within the more superficial ovisacs, producing a gradual increase in their size. As the time for the discharge of the ovum draws nigh the walls of the follicle become more vascular, the intra-follicular fluid increases in amount, while the tunica albuginea and epithelial investment of the ovary yield before the steadily enlarging ovisac, until it finally protrudes from the surface of the gland as a tense, translucent vesicle. The next event in the physiological cycle would be the rupture of the follicle at its weakest point (the stigma),

followed by the discharge of the ovum; should this not ensue, however, the condition of affairs assumes a pathological aspect, dropsy of the follicle supervenes, and the career of a retention-cyst is initiated.

These follicular retention-cysts may occur in one or in both ovaries;

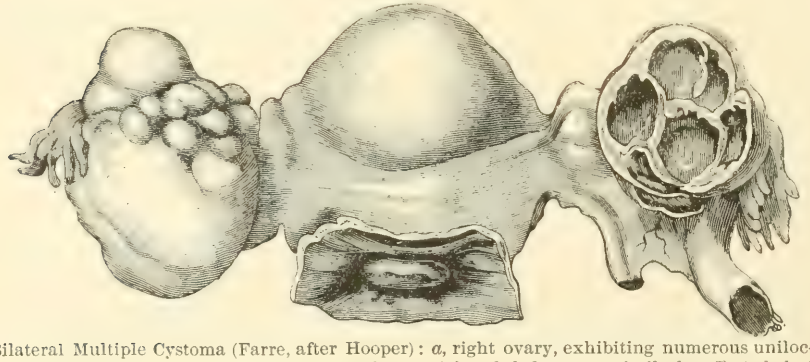
Fig. 321.



Ovary with Numerous Distended Follicles (Olshausen, after Leopold).

may be small or large, single or multiple; and, though most frequently observed during the period of sexual activity, may form at any age. When present late in life the normal shrinkage of the surrounding stroma, due to physiological atrophic processes, causes the cysts to

Fig. 322.



Bilateral Multiple Cystoma (Farre, after Hooper): *a*, right ovary, exhibiting numerous uniocular cysts consisting of enlarged Graafian vesicles; *b*, left ovary, similarly affected, but unopened; *c*, uterus.

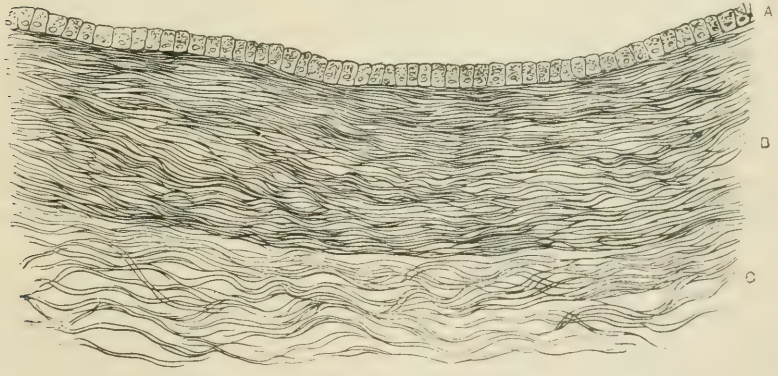
project more prominently from the surface of the ovary, and in well-marked cases may give them a pedunculate appearance. The mere occurrence of the liquor folliculi in a fœtal ovary stamps the case as one of dropsical degeneration, while in the adult the normal size of the fully-developed ovisac is to be considered before pronouncing the

condition to be pathological. Though but one follicle may be involved, it is usually the case that a greater or less number (ten to twenty) are affected from the beginning; and these may enlarge either uniformly or the reverse. Usually, however, one follicle outstrips the others in growth, and may attain the size of a man's fist, or, in exceptional instances, a child's head, the whole tumor rivalling, or even exceeding, in bulk the head of an adult. This size, however, is but rarely observed. Less frequently two or three cysts may thus develop into prominence at the expense of the others, which either cease to enlarge or undergo atrophy from pressure. Such tumors, then, are usually unilocular or monocystic, though where two or more cysts are concerned, as in the latter instance, we have the much rarer paucilocular, oligocystic, or multiple (Farre) tumor.

Pressure may cause coalescence and atrophy of the walls of contiguous follicles, and thus two or more of the cysts may finally intercommunicate, though this very rarely occurs.

Walls.—In simple dilatation of the Graafian follicles the thickness and strength of the walls keep pace with the increasing eccentric bursting force exerted by the follicular contents, so that even in the large cysts the follicular membrane is thicker than in the ripe ovisac. Should this not occur, should the new connective tissue be formed too slowly or in amounts insufficient to meet the demands made upon it, the wall of the cyst becomes thinner and thinner at its most prominent part, and may finally give way, the contents of the diseased ovisac being expelled

FIG. 323.



Section of the Wall of a Simple Ovarian Cyst: A, epithelial lining; B, dense fibrous layer; C, loose fibrous layer (Olshausen).

into the peritoneal cavity. The inner surface of these cysts is smooth, and lined with a single layer of cylindrical epithelium, which becomes thinner and more flattened as the pressure of the enclosed fluid increases; while sections show that their walls are composed largely

of fibrous tissue, in which the coats of the original ovisac, the tunica fibrosa and tunica propria of Henle, may at times be recognized.

Contents.—A clear, pure serum, having a specific gravity of 1005 to 1020, and resembling the normal liquor folliculi, is usually found within the cysts, though this fluid may be viscid, turbid, purulent, or may present the various shades of red or brown due to the presence of fresh or degenerated red blood-corpuscles. Except hemorrhage or suppuration has occurred, however, the morphological constituents of the fluid are few, though some epithelial cells may also be found. The chemical substances present are albuminoids, salts—especially chloride of sodium—and occasionally cholesterin.

The cystic degeneration of one or more Graafian follicles does not usually interfere with the occurrence of menstruation and pregnancy, healthy ovisacs being present in the intercystic stroma; though in cases of follicular dropsy, marked both in degree and in the number of affected vesicles, condensation and atrophy of the remaining gland-tissue ensue, which in extreme cases may become complete. Though usually free from adhesions, these multiple[1] ovarian cystomata may be attached to the surrounding structures.

If some care be exercised, the degenerated ovisacs may be dissected or shelled out from the surrounding stroma, and removed intact for examination, this procedure being greatly facilitated by the presence of a stratum of loose connective tissue between the tunica fibrosa of the follicular wall and the ovarian stroma. The smaller vesicles may be opened directly upon a slide, the larger in some receptacle which affords a dark background, and thus aids the detection of any formed body resembling an ovum. Studies of this kind have resulted in the discovery of ova in the smaller cysts, though they quickly degenerate and become extinct as the dropsical follicle enlarges.

The first to note the occurrence of ova in multiple cystomata, and to thus definitely establish the histogenesis of this variety of ovarian tumor, was Rokitansky,[2] who in examining *post-mortem* the body of a woman aged twenty-six found that the right and left ovaries were as large as a child's head and a man's fist respectively. Each was composed of a number of cysts as large as cherries, most of which were closely packed together, flattened here and there by mutual pressure, and occasionally projecting into each other. The surfaces of the tumors were thus slightly lobulated, and between these larger protuberances were seen smaller cysts, ranging in size from a barley-corn to a bean.

[1] The term *multiple* is employed, as suggested by A. Farre, to distinguish the tumor formed by the aggregation of two or more simple cysts of contemporaneous growth from the *multilocular, compound,* or *proliferous* variety, in which the secondary cysts are the result of endogenous proliferation.

[2] *Wochenblatt der Zeitschrift der k. k. Gesellschaft der Aerzte zu Wien,* Bd. i. 1855.

When opened these smaller cysts discharged a greenish fluid containing membranous flocculi, and in each of them was found an ovum, softened, dull in color, and easily disintegrated. The sharp contour of the zona pellucida had almost disappeared, and, with one exception, no germinal vesicle could be discovered. About ten years subsequently, in 1864, Sir Spencer Wells operated upon a woman fifty-four years of age at the Samaritan Hospital, London, removing both diseased ovaries. The tumors were about the size of an adult's head, and composed of clusters of variously-sized vesicles. Dr. Charles Ritchie first called attention to the fact that in each of the tumors there were a number of small cysts which were evidently enlarged Graafian follicles. This view was confirmed by Drs. Ritchie and Webb, both of whom found ova in the smaller cysts; and the former subsequently says:[1] "Since last August (1864) I have succeeded in finding ova in some of the loculi of a large number of ovarian cysts. Some of the ova were perfect, with a sharply-defined zona pellucida, a germinal vesicle, and a germinal spot; others were more or less imperfect, many having the appearances mentioned by Rokitansky. I have never found an ovum in a loculus larger than a cherry, and never in a loculus which contained jelly-like contents." Mr. Lawson Tait is the only observer, other than those already mentioned, who has met with instances of this form of multiple cystoma—"Rokitansky's tumor" as Tait terms it—and his experience is limited to two cases. One of the tumors removed from Tait's second case is

FIG. 324.

Multiple Ovarian Cystoma of Rokitansky (Tait).

[1] Ritchie, *Ovarian Physiology and Pathology*, London, 1865.

figured in the accompanying illustration (Fig. 324). On the right side is seen the omentum, the resection of the major part of which was necessitated by the existence of localized adhesions and the fact that many of the component cysts of the tumor had apparently grown through its meshes. Each of the loculi examined by Mr. Tait was lined with columnar epithelium, and contained a more or less perfect ovum; whence he infers that every sac represents a Graafian follicle distended by an excess of the liquor folliculi.

Etiology.—It is quite certain that no one cause exists to the exclusive agency of which all cases of follicular dropsy can be satisfactorily ascribed; and it is doubtless in recognition of this fact that almost every author advances arguments in favor of some special theory which oftentimes has little else than its evident ingenuity to commend it. That inflammation, however, both in its immediate and secondary effects, plays an important rôle in this connection is quite evident. The increased congestion of the follicular walls attending the inflammatory process would certainly be attended with an increased exudation into the ovisac, to say nothing of any direct effect upon the ovum itself; while the formation of new connective tissue in the ovarian stroma, coupled, it may be, with pseudo-membranous deposits upon the surface of the gland, would tend to retard the rupture of the follicle, and thus convert it into a retention-cyst. It is a fact that the stroma is generally found greatly condensed in cases of follicular dropsy; and Chrobak[1] mentions the development of a follicular cyst after recovery from pelvic peritonitis. Rindfleisch[2] is inclined to attribute the non-rupture of the Graafian follicle to a deficient bursting-force in the majority of cases. He assumes that at the time of menstruation an expansible colloid material is produced by the cells of the membrana granulosa in the mature ovisac, which combines with the liquor folliculi, swells, and causes the rupture, just as the cranial bones are forced asunder when the skull-cavity is filled with dried peas and exposed to the action of water. Should too little of this colloid material be formed, the follicle would remain intact. According to Scanzoni,[3] this result may be caused by the imperfect congestion due to general hydræmia. Follicular cysts of the ovary are always of very slow growth, and, as a rule, give rise to few symptoms, their small size and benign course causing them to be overlooked. In the case of the larger multiple cystomata the invariable involvement of both ovaries is the only fact leading to operative interference. Spontaneous or traumatic rupture of the dropsical follicles may take place; in many cases, doubtless, a cure is thus effected. A variety of this form of cyst is caused by the degeneration of a corpus luteum, the point of rupture having closed. The original observations

[1] *Wiener med. Presse*, 1872, No. 42.

[2] *Lehrbuch d. path. Gewebelehre*, S. 465.

[3] *Beiträge z. Geb. u. Gyn.*, Bd. v. S. 170.

of Rokitansky[1] on this point have since been confirmed by Schroeder and others.

Hemorrhage may take place into a Graafian follicle, forming blood-cysts ranging in size from a walnut to a man's fist (Leopold), while interstitial hæmatomata of any considerable size are much seldomer met with. The follicular apoplexy is probably due to blood-stasis occurring in the course of various disorders, or to the engorgement consequent upon torsion of the mesovarium or pedicle. Should such a follicle rupture, the hemorrhage into the peritoneal cavity may be so profuse as to occasion death. When the hemorrhage is interstitial the blood may infiltrate the entire stroma (Fig. 325).

FIG. 325.

Hæmatoma of the Right Ovary succeeding scurvy, with polypoid hæmatoma of the uterus and left hæmatosalpinx: *O.s.*, left ovary; *c.l.l.*, cyst of broad ligament (Olshausen).

The adenomata are new formations developed from the glandular constituents of the ovary, whether these be cell-nests, Graafian follicles, or tube-like epithelial structures; but, though of frequent occurrence as the forerunners of cystomata, they are rarely observed in the pure, non-cystic form,[2] since their existence in that state is a very transient one. Inasmuch as its epithelium is of the cylindrical type, such a neoplasm is termed an *adenoma cylindro-cellulare*, from which, through the secondary dilatation of its saccules and tubules due to retained secretions, is developed the *adenoma cysticum*. Because of the fact that in the early stages of its development the adeno-cystoma is thus a purely glandular growth, it will readily be seen that should the specific fluid contents fail to be secreted, a pure adenoma cylindro-cellulare would be the result. Such a solid tumor is an extreme rarity; indeed, but one well-authenticated case has thus far been recorded, and that by Schroeder.[3] The growth equalled in size the pregnant uterus at term,

[1] *Allgem. Wiener med. Zeit.*, 1859, No. 34.

[2] For descriptions of such adenomata consult the *Obstetrical Transactions*, vol. vi. pp. 181–183; Doran, *op. cit.*, pp. 32–34; Boettcher, *Arch. f. path. Anat. u. Phys.*, Bd. xlix. S. 306.

[3] "Handb. d. Krankh. d. weibl. Geschlechtsorgane." *Ziemssen's Handb. d. spec. Path. u. Therap.*, Bd. x. 1880, S. 360.

but all attempts to facilitate its removal in the usual manner failed, not a drop of fluid following the introduction of a large Veit's trocar; subsequent examination revealed the fact that the tumor was quite solid, consisting only of adenomatous tissue, in which none but the minutest traces of cystoid degeneration could be detected.

Finally, the adenoma cysticum develops into the cystoma *par excellence*, as the retained cell-secretions increase in amount and ultimately become excessive.

From an anatomical point of view, as well as from the consideration of their genesis and clinical features, two leading varieties of the ovarian cystoma have within recent years been recognized: the proliferating glandular cystoma (*cystoma proliferum glandulare*), and the proliferating papillary cystoma (*cystoma proliferum papillare*), between which, however, there are various intermediate or mixed forms.

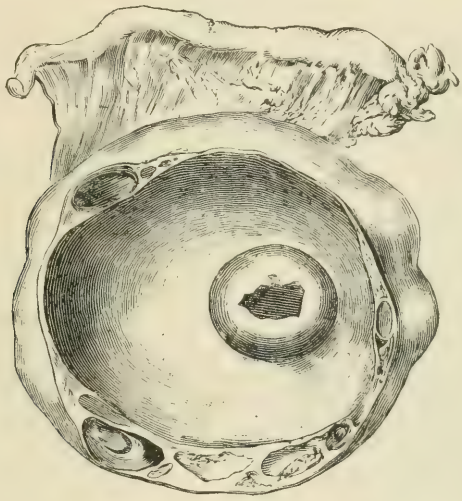
Proliferating Glandular Cystoma of the Ovary.

Synonyms.—Multilocular ovarian cyst, myxoid cystoma, multilocular colloid, compound cystoid, adenoma cylindro-cellulare cysticum, epithelioma mucoides.

As the simple follicular cysts which have just engaged our attention originate in the parenchymal zone only of the ovary, so do the common proliferating cystomata of the glandular type, inasmuch as their genesis may, in all probability, be referred to the glandular or germinal epithelium, either before or subsequent to the formation of the Graafian follicles. The vascular zone, on the other hand—and particularly that portion adjacent to the hilum, and in which the medullary strands of Kölliker are presumably best developed—is the customary seat of those multilocular proliferous cysts which are characterized by the exuberant papillomatous growths that beset their inner surfaces. (See Fig. 331 and Pl. IV., Fig. 4.) From this consideration of the topographical distribution of the ovarian cysts it becomes apparent why the development of the ordinary glandular cystoma should take place at the marked sacrifice of the organ's integrity. Seated in the free or intra-peritoneal portion of the ovary, the tumor in its growth forces the yielding tissues before it, rapidly destroying the normal contour of the gland and rendering uncertain in location the scattered remains of its normal parenchyma. In a large cystoma of this variety, therefore, the whole of the degenerated ovary is present, its outer wall being formed, in part at least, of the cystically distended ovarian stroma. Though occasionally sessile, such cysts generally possess a very distinct pedicle, the hilum, as a rule, remaining free from disease. Sometimes, however, as we have just intimated, a glandular cystoma invades the broad ligament; that is, its development is extra- rather than intra-peritoneal, and it forms a ses-

sile tumor. Two instances of this comparatively rare condition are described by Doran.[1] Whether the anomalous mode of growth is to be attributed to the fact that the tumor originates at such an unusual depth in the substance of the ovary that the direction of least resistance is reversed, and whether it is due to secondary structural changes

FIG. 326.



A Proliferating Glandular Cystoma of the Ovary, slightly reduced from the natural size (Doran).

in the gland resulting from inflammation, etc., are questions not yet solved. It is probable, however, that the intra-ligamentous development of a glandular cyst may be determined by either condition. Of all ovarian tumors, the glandular cystoma is the most common and calls oftenest for surgical interference, as is strikingly shown by the experience of Doran. This author asserts that out of 605 cases of abdominal section performed in his presence for the relief of all diseased conditions demanding such treatment, 366 were operations for the removal of these growths.[2] In size they vary between the widest limits, their growth in extreme cases being determined only by the distensibility of the abdominal walls;[3] while their shape is usually irregularly spherical. The smaller and younger tumors, being largely composed of little cysts of a nearly uniform size, are usually more irregular and resistant than the larger ones, their firmness being due not only to the smallness of the loculi, but to the greater density of

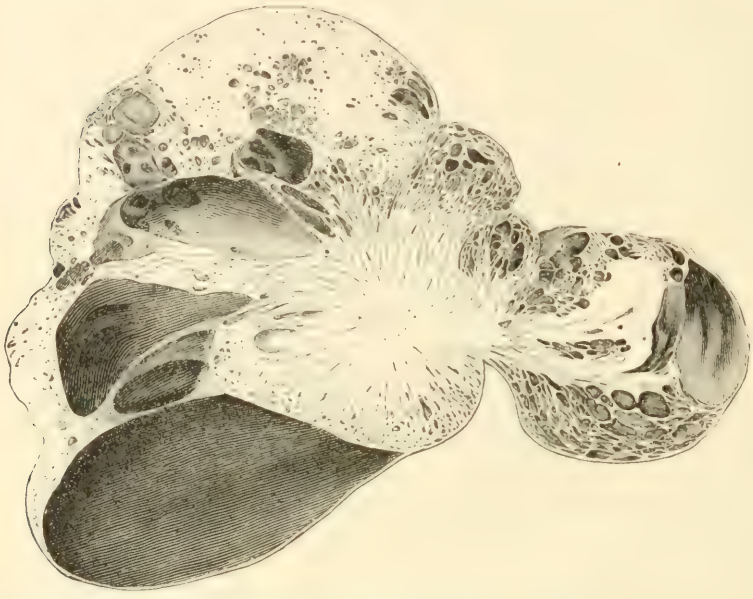
[1] *Op. cit.*, p. 75.

[2] *Ibid.*, p. 20.

[3] Kimball of Lowell (quoted by Peaslee, *Ovarian Tumors*, p. 37), in attempting the removal of an enormous proliferating cystoma, was forced to abandon the operation after drawing off one hundred and sixty pounds of fluid, though more than twenty pounds remained.

their contents as well. Instead of the whole, such parvilocular, honeycomb-like structures may form a part only of a cystoma; and in either case they often resemble on palpation a perfectly solid growth.

FIG. 327.



Section of an Ovarian Cystoma in the Process of Development, showing how the larger sacs are formed by the gradual confluence of the smaller loculi (reduced one-fifth).

Instead of these intra-cystic growths composed of fibrous stroma and tubular follicles, solid matter of a sarcomatous or carcinomatous nature may be present. As the tumor increases in size, one or more of the cysts develop more prominently than the others; and, inasmuch as their contents are usually thinner and of lower specific gravity than those of the smaller cysts, fluctuation will be evident, provided the distension be not too great, while percussion elicits a distinct thrill. The large cysts may be entirely independent, being separated from each other by thick partitions; usually, however, one main, principal, or primary cyst is present, in the interior of which are numbers of smaller, secondary ones. The secondary or "daughter"-cysts grow from the walls of the primary or "mother"-cyst, and tend to invade its interior, filling this completely at times. A single secondary loculus in its growth may entirely fill the primary cyst, by the repetition of which process the primary wall becomes markedly thickened. More frequently, however, the walls of contiguous cysts coalesce, undergo atrophy from mutual pressure, and finally rupture, the two interiors becoming thus united and forming a cavity resembling an hourglass in shape. The tendency of such a rupture in the septum between two

secondary cysts or loculi is to increase in size, by reason of the eccentric force exerted by the ever-increasing fluid contents, till, finally, not even a ridge-like projection marks the location of the original fused walls, every sign of the cystic union having disappeared. The manifold repetition of this process naturally results in the diminution of the number of loculi, unless the formation of new cysts keeps pace with their destruction; and thus the ovarian cystoma, which at first is always multilocular, tends to assume the paucilocular, and finally the unilocular, form. The remains of the secondary cyst-walls persist for a long time as narrow interlacing bands of white fibrous tissue, slightly raised above the inner surface of the main sac. Should a secondary loculus, forming an outgrowth from the inner wall of the main cyst, burst, its site is marked by an ulcer-like surface surrounded by the remains of its walls (Fig. 328). Occasionally the pressure exerted by the secondary cysts upon the wall of the main sac results in atrophy and rupture of the latter, followed by its retraction; in which case the daughter-cysts protrude, forming a tumor which might be likened to a pile of cannon-balls. Such a false exogenous cyst is of serious import, from its liability to form adhesions to the omentum and intestine, as well as from the facts that it is often filled with solid growths and is apt to rupture. Its recognition is facilitated by the appearance presented by the walls of the secondary sacs, these being thin and very vascular. The existence of the true form of exogenous cyst—that is, where the component sacs of a tumor have been independent from the start, and never included within a common wall—is attested by the experience of Mr. Thornton, related by Doran. By the same process as that which results in the union of two secondary cysts, multilocular cystomata affecting both ovaries may be joined together, forming the so-called *double* or *fused* cysts. In such a case, naturally, two pedicles would be present; and, should the situation be still further embarrassed by extensive pelvic adhesions, the difficulties confronting an operator may easily be understood.

FIG. 328.

Ruptured Secondary Cyst, on the inner aspect of the main wall of an ovarian tumor, in the process of effacement (Doran).

The *wall* of the main sac in a typical multilocular cystoma is made up of fibrous tissue, the outer surface of which is covered with a simple layer of flattened cells, resembling those of the adjacent peritoneum and usually spoken of as endothelial; while upon the inner surface rests the lining epithelium of the cyst. The thickness of this fibrous coat varies greatly, being most marked in the neighborhood of the

pedicle, where three layers may generally be recognized: an external and internal of fibrous structure, and a middle stratum of loose connective tissue. As we recede from the pedunculer attachment of the tumor, the middle coat becomes less and less distinct, and finally disappears, the external and internal coats blending into a single homogeneous fibrous membrane of comparative tenuity. When three lamellæ are present the arrangement of the blood-vessels supplying the cyst is as follows: the large arteries are found in the middle layer, their capillaries chiefly in the internal coat, immediately beneath the epithelial lining of the cyst, while most of the veins, which are large and muscular, are located in the external lamella.[1] As the pedicle is neared lymphatics of large size and abundantly supplied with valves accompany the vessels to the broad ligament. Nerves, too, have been found in the cyst-walls, though their ultimate distribution is not yet understood.

The *contents* of ovarian cysts of the glandular variety vary between wide limits; indeed, there may be wellnigh as many fluids, possessed of quite different physical properties, as there are loculi in the tumor. As a rule, the fluid changes with the size of the cysts, being usually thin and watery in the very large ones, while in the smaller cavities it resembles strained honey, or even a dense semi-solid jelly, which cannot be evacuated through the canula, but requires rather the hands of the operator for its removal. As we shall see in a subsequent section, these changes in the physical characteristics of the cyst-contents depend upon alterations in the secreting epithelium. The color of the fluid ranges from light gray to black, the various shades being due to the presence of fat, pus, cholesterin, blood, etc. in variable amounts. The glandular cystomata are bilateral in about 3 to 4 per centum of the cases, and, as will be seen in a subsequent section, metastatic tumors resembling in structure the primary ovarian growth may be disseminated throughout the whole peritoneal cavity.

Proliferating Papillary Cystoma of the Ovary.

Synonyms.—Papillomatous ovarian cyst, multilocular ciliated cystoma.

Though Waldeyer, in his remarkable work on the ovarian tumors of epithelial origin,[2] distinguished the papillary from the glandular cystoma, he based this distinction merely upon the presence or absence

[1] Waldeyer, in his article on "Die Epithelialen Eierstocksgeschwülste, insbesondere die Kystome," *Arch. f. Gynäk.*, Bd. i. S. 252, denies that the distribution of vessels in the cystomata is at all peculiar; while W. Fox (*Med.-Chir. Trans.*, vol. xlviii. p. 227) refers to their spiral course as in the normal ovary.

[2] *Arch. f. Gynäk.*, Bd. i. 1870.

of intra-cystic papillary growths, evidently thinking that no further differences of an essential nature existed between the two forms. Some seven years later, however, Olshausen,[1] by virtue of his extensive clinical and operative experience, was enabled to claim for papillomatous cysts a more distinct position by showing that they differed from the glandular variety, not only anatomically, but clinically and genetically as well; and this view the labors of many more recent investigators have tended to sustain.[2] It is from the relics of the Wolffian body that these papillomatous growths are prone to develop; and hence they are met with in certain cysts, not only of the broad ligament, but of the ovary as well. As we know, some of the parovarian tubules are continued through the mesovarium into the vascular hilum of the ovary, where they form a branching network of so-called medullary strands, about the ultimate termination of which very little is known. But even if we are indisposed to accept the views of Kölliker, who would derive the cells of the membrana granulosa and discus proligerus from those of the medullary strands, it is certainly not unreasonable to suppose that scattered remains of the latter structures occur in the parenchymal zone, some of which may later give rise to papillary formations. Such an hypothesis explains most satisfactorily the occurrence of mixed cysts of the glandular and papillary types. The true papillary cystoma, however—in which the juicy glandular or adenomatous tissue of the cysts just described is replaced by exuberant, firm papillomatous growths—originates, as a rule, in the vascular hilum of the ovary, where the traces of the Wolffian tubules persist. Seated as it is, then, in the attached portion of the organ—in its stalk as it were—and developing in the direction of least resistance, such a cystoma proliferum papillare in its growth tends to invade the loose connective tissue between the folds of the broad ligament rather than the dense ovarian stroma, the free or intra-peritoneal portion of the genital gland being displaced, of course, but retaining its normal configuration till the tumor has attained considerable proportions. This condition is well illustrated by Fig. 329, which represents a tumor exceeding twelve inches in diameter. Indeed, each of the three forms of cysts thus far considered exhibits a different relationship to the ovary: the dropsical follicles protruding from the free surface of the organ; the glandular cysts causing its uniform enlargement; while, as we have just seen, papillary cystic disease of the ovarian hilum is long attended with simple displacement rather than disorganization of its more superficial parts. (See Fig. 321 and Pl. IV. Figs. 2 and 4.) A section through the wall of such a papillomatous hilum-cyst, so made as to include the ovary, is

[1] *Vide* Olshausen: "Diseases of the Ovaries," *Cyclop. of Obstet. and Gyn.*, vol. viii.

[2] Compare Coblenz, *Virchow's Archiv*, Bd. lxxxii. H. 2, und Bd. lxxxiv. H. 1; also, Doran, *op. cit.*

well shown in Fig. 330. The mass of papillary growths (*pw*) springing from the base of the ovary is seen to include spaces (*is*), most of which are filled with the same dendritic structures. These spaces are

FIG. 329.

A Large Papillomatous Cyst springing from the Hilum of the Ovary, the greater part of which organ is not involved in the morbid growth. The cyst, which has forced its way between the layers of the broad ligament as far as the Fallopian tube, has had its outer surface and cavity exposed to view by the removal of portions of its serous envelope and wall (Doran).

either interpapillary, and formed by the coalescence of the free ends of the villous processes in the manner described by Fox,[1] Rindfleisch, and many others, or they represent cystic enlargements of the tubular Wolff-

FIG. 330.

Section through the ovary and Wall of a Papillomatous Cyst, showing the origin of the tumor in the hilum (natural size after hardening): *c*, cyst-wall; *ov*, ovary with dropsical ovisacs; *pe*, epithelial surface of ovary; *ds*, blood-vessels; *pw*, papillary growths; *is*, interpapillary spaces; *lr*, round ligament (Coblenz).

ian relics existing in that locality. Though true papillomatous cysts may resemble the ordinary glandular type in their intra-peritoneal

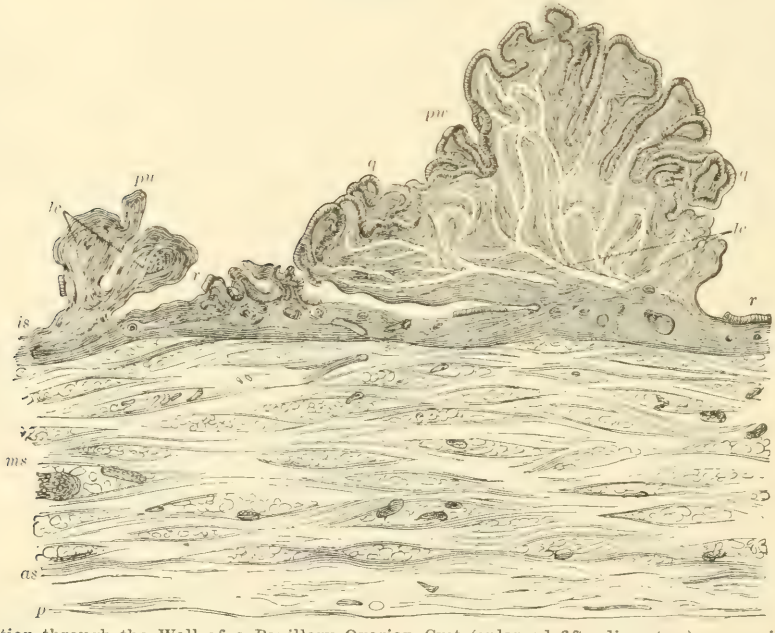
[1] Compare Wilson Fox: "On the Origin, Structure, and Mode of Development of the Cystic Tumors of the Ovary," *Med.-Chir. Trans.*, vol. xlvii., 1864.

development and in the possession of pedicles,[1] still such cases form exceptions to the rule, and, as already intimated, may be genetically ascribed to Wolffian remains in the parenchymal zone. As a usual thing, however, the invasion of the broad ligament by a papillary cyst keeps pace with its growth, the cyst becoming more and more sessile, while the difficulties attending its removal generally increase *pari passu* with its subserous development. When, in the course of an operation, such a tumor is exposed to view, it presents some marked anatomical peculiarities. The peritoneal folds of the ala vespertilionis are widely separated, the upper border of the ligament presenting a broad convex surface; while the normal serous reflections and pouches of the pelvic roof are more or less completely obliterated on the affected side, the serous covering of the tumor often merging into that of the iliac fossa and fundus uteri without any sensible depressions. The uterus is forced to the opposite side of the pelvis, and, as a rule, is more or less elevated by the combined pressure and traction exerted by the growing tumor. In case both ovaries are diseased, the upward displacement of the uterus is more marked; indeed, the two tumors, which may occupy the entire pelvic cavity, often conceal the intervening organ completely by their apposition. But, unless the further expansion of the tumor takes place at the entire expense of the anterior or posterior fold of the broad ligament, it soon outgrows the intra-ligamentous space and invades the underlying connective tissue of the cavum pelvis subperitoneale (Luschka), where the available capacity of the pelvis may alone determine its limits. Thus the tumor, displacing the bladder more or less, and perhaps stripping the peritoneum from its base and summit, may force its way into the subserous areolar tissue of the anterior abdominal wall. Should laparotomy be attempted in such a case, the peritoneum would be reached only after the removal of the intervening cyst. In like manner, the recto-uterine and recto-vaginal spaces may be invaded, the peritoneum of Douglas' cul-de-sac suffering an upward displacement; or the tumor, passing more posteriorly, reaches the loose retro-peritoneal tissue, and, continuing upward, comes to lie between the large vessels in front of the spinal column and the intestines. In some cases, indeed, the extra-peritoneal cystic growth forces apart the folds of the mesentery, sigmoid mesocolon, or mesocæcum, and thus comes into direct contact with the subserous structures of the small intestine, sigmoid flexure, or cæcum and vermiform appendix respectively. This extra-peritoneal development, which is a marked characteristic of the papillary cystomata, occurs in the majority of cases, and generally in the intra-ligamental space.

[1] Doran (*op. cit.*, p. 71) mentions four cases of this kind, ascribing the anomalous direction of growth to the fact that the papillary structures were in no instance either abundant or exuberant.

The important anatomical feature of the papillomatous cysts, however, is the presence of villi or papillæ, in either simple or compound form, upon the inner surface of the cyst-wall, which resembles a mucous membrane in appearance. These outgrowths, ranging in height from one to two millimeters, may stud the entire surface or be limited to comparatively small areas of the lining membrane; and when of the villous type and closely set (villous growths of Fox), they form a smooth, velvety surface. Instead of this simple form, the growth may assume a most complex and intricate arrangement, the papillæ being very numerous, long, and branched, besides giving origin to secondary and tertiary offshoots resembling the placental tufts. In such a case, there being but a single layer of cubical or columnar epithelium investing its surface, the growth presents a branched, villous, or cauliflower appearance. Such dendritic aggregations of papillary vegetations form masses ranging from the size of a pea to that of a small apple, and project into the lumen of the cyst, their attachment to the cyst-wall being either pedunculate or sessile (Fig. 331). These

FIG. 331.



Section through the Wall of a Papillary Ovarian Cyst (enlarged fifty diameters): *p*, peritoneal coat; *as*, outer layer of the fibrous wall; *ms*, middle layer; *is*, inner layer; *pw*, papillary growths; *q*, transverse sections of papillæ; *lc*, empty capillaries; *r*, remains of epithelial lining (Cobienz).

papillomata consist of a connective-tissue stroma, often richly cellular, which is dense in the pedicle, looser in the free extremity of the growth, and affords support for blood-vessels of considerable size, branches of

which enter each of the component papillary processes and terminate in a single loop or in a fine capillary network. The entire papilloma is covered with a single layer of cylindrical epithelium, appearing as a beautiful mosaic of pentagonal and hexagonal cells, each of which contains a relatively large, round, and centrally disposed nucleus with its nucleolus. At the base of the growth its epithelial covering merges into that lining the cyst. Ciliated cells are found here and there upon the inner surface of the cyst; though, when small, the latter is frequently lined throughout with ciliated epithelium. This compound construction of the papilloma explains its doubtful position among the tumors, it being on the boundary-line between the epithelial and desmoid neoplasms. Those who regard the increase of the stroma as the essential feature in the tumor's growth class it among the connective tissue or histioid formations, while others consider the base subordinate to the cellular investment, and rank the papilloma with the other new formations of an epithelial type. The color of the papillary structures varies from pure white to dark red, or even black. Usually the papillæ contain numerous round or irregular-shaped concretions, *corpora arenacea*,[1] composed of the carbonate and phosphate of lime, which impart a gritty feeling on palpation, just as in the psammomata of the brain and its membranes. The calcareous deposits have a stratified appearance, and occur principally in the stroma, having no connection with the epithelium, but rather with the capillaries.[2] Forming in the immediate vicinity of the latter, probably in the perivascular lymph-spaces, they often cause the complete obliteration of the vessels, the terminal loops of which, however, are most apt to be thus affected. Though similar in structure to the papillary growths of the bladder and intestine, the intra-cystic papillomata are less prone to secondary ulceration and hemorrhage, probably because of their greater immunity from mechanical irritation. When handled during an operation, however, the soft, vascular growths bleed freely. Though distributed more sparsely, as a rule, over the inner surface of large cysts, the smaller loculi of a papillary cystoma may often be completely filled with these luxuriant dendritic growths, while both the secondary and main cyst-walls are frequently perforated by them. The papillomata in the latter instance tend to spread not only over the tumor itself, but over the adjacent serous surface as well, studding the bladder, uterus, and rectum, as well as the omenta and

[1] Consult Coblenz, *Virchow's Archiv*, Bd. lxxxii. S. 273; Ackermann, "Carcinoma mammæ cum corporibus arenaceis," *ibid.*, Bd. xlv. S. 60; Kolisko, *Wiener med. Jahrb.*, 1884, H. 2 u. 3.

[2] From the fact that these psammomatous concretions occur in the cavities of cysts, and may entirely fill those of small size, Marchand ("Beiträge zur Kenntniss der Ovarientumoren," *Abhandl. d. naturf. Ges. zu Halle, a. S.*, Bd. xiv. H. 3) thinks them closely related to the epithelial structures.

abdominal viscera, and even appearing on the peritoneal covering of the diaphragm.[1] When psammomatous, these metastatic growths may be diagnosticated, even in the hidden recesses of the peritoneal cavity, by the sense of touch, a thickly-beset surface feeling like a grater. Thus the outer surface of the cyst may become the seat of tumor-like papillomatous growths of various sizes, which, as in the case of the inner surface, may be either sessile or pedunculated. This peculiar metastatic dissemination of the papillomata resembles that occasionally observed in the case of colloid cysts; the secondary growths in the latter instance constituting, as we have seen, the so-called *myxoma peritonei* (Netzel) or *pseudo-myxoma peritonei* (Werth). Instead of

FIG. 332.

Papillary Cystoma of the Ovary, with Perforating Papillomata (Olshausen).

thus appearing on the free surface of the cystoma, however, the papillomata may penetrate its wall beneath the peritoneum and extend into the surrounding connective tissue, or even invade the neighboring viscera. Thus the base of the tumor may become firmly attached to the pelvic floor, as well as to the bladder, uterus, or rectum.[2] Ascites frequently accompanies these tumors, particularly when the papillomatous growths invade the peritoneal lymph-space; and, should tapping be resorted to, the fluid, which represents the secretion of the epithelial cells covering the papillary deposits, quickly reaccumulates.

[1] *Vide* Doran: *op. cit.*, p. 70. [2] Consult Klebs, *Handb. d. path. Anat.*, 1876, S. 797.

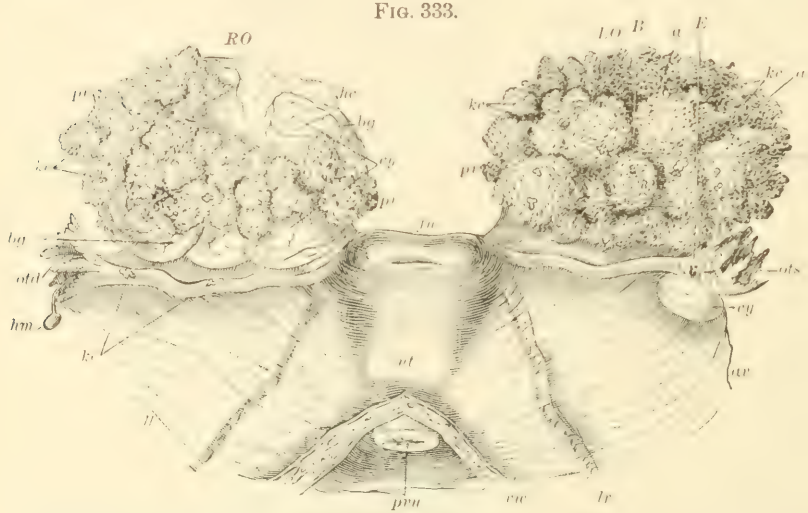
These clinical signs of malignancy, and the fact that death results from the general infection of the peritoneal cavity with papillomatous deposits, evidence a disposition on the part of the papillary structures to undergo cancerous degeneration, and have led to the employment of the terms "papillary carcinoma," "villous cancer," "epithelioma," and "cancroid" of the ovary. Macroscopically, the differentiation between the benign and malignant forms of papilloma ovarii is out of the question; though, in view of the fact that cancerous disease may be present, the rapid proliferation of the lining epithelium of a cyst would tend to arouse our suspicions. In doubtful cases, however, the microscope should be resorted to, the criterion of malignancy being the discovery of heterologous epithelium within the connective-tissue basis of the growths. This dual character of the cystoma proliferum papillare is well attested by the words of a leading ovariotomist,[1] who says: "But my most recent experience tends to show that there are two forms of papilloma associated with ovarian tumors—one malignant, and one not so. The latter speedily disappears after the removal of the tumor, and the patient gets quite well, though its naked-eye appearances are quite indistinguishable from those of the malignant kind. I have had two cases within the last year, aged fifty-seven and thirty-eight respectively, where I have left large masses of papilloma, fixing the uterus in both cases. Since the operations these masses have entirely disappeared, and the patients are both in perfect health." These papillomatous masses do not bear operative interference well; and, as a rule, the immediate consequences of their incomplete removal are seemingly more serious than those which would ensue were sarcomatous tissues to be left behind in the peritoneal cavity. Though sarcomatous disease of papillary cysts has been reported, the authenticity of the cases is doubtful (Coblenz). The papillary cystomata, which in 75 per cent. of the cases are bilateral, fail to attain the great size so often observed in the glandular variety, and have but few secondary loculi; while, instead of the thick colloid material which is so characteristic of the cystomata glandularia prolifera, the fluid within the papillomatous cysts is clear and free from glair. In addition to the clinical features upon which we have already dwelled, it must be stated that the latter tumors develop much more slowly than the former; though, in consequence of their extra-peritoneal growth, the symptoms due to pressure supervene both earlier and oftener than in the case of the multilocular colloid cysts. The practical conclusions which immediately suggest themselves from the foregoing are—first, that tapping and exploratory puncture of ovarian cysts are to be avoided; secondly, that their removal should be effected at as early a date as possible.

Superficial Ovarian Papilloma.—The presence of papillomata

[1] Tait: *op. cit.*, Amer. ed., p. 147.

upon the surface of the ovary is by no means a rare phenomenon, as we have seen; though the growths are usually of secondary development, following the rupture of a pre-existing cyst of the ovarian hilum or broad ligament. In a few instances, however, cauliflower excrescences, growing primarily from the ovarian surface and entirely distinct from intra-ovarian structures of like nature, have been reported. Thus Coblenz describes a specimen of bilateral superficial papilloma removed from a multipara aged sixty-six years.[1] Each ovary formed a tumor about the size of a goose-egg and contained a number of cysts, though the growths differed in this respect: while the whole free surface of the left genital gland was overgrown with papillary neoplasms, in the right these structures formed a zone which seemingly corresponded to the sero-mucous boundary-line of Waldeyer (Fig. 333). The epithe-

FIG. 333.



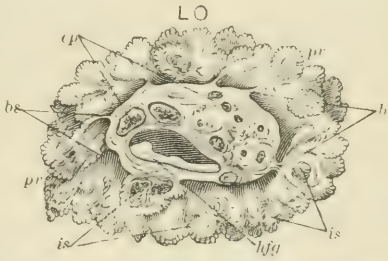
Superficial Papilloma involving both Ovaries (front view): *RO*, right ovary; *LO*, left ovary; *fu*, fundus uteri; *hc*, hyaline cyst; *pv*, papillary vegetations; *cy*, cystic tumors; *bg*, blood-vessels; *hm*, hydatid of Morgagni; *otd*, abdominal orifice of right tube; *ots*, abdominal orifice of left tube; *kc*, calcareous deposits; *ll*, broad ligament; *lr*, round ligament; *av*, ala vespertilionis; *ut*, uterus; *pvu*, vaginal portion of uterus; *vw*, vaginal wall laid open (Coblenz).

lial covering of the papillary apices consisted of long cylindrical cells, which gradually assumed a more cuboidal form on the pedicles of the cauliflower excrescences, to merge finally into the low germinal epithelium of the ovarian surface. The presence of calcareous deposits in the papillæ imparted to the growths that peculiar gritty character of which we have already spoken. A sagittal or transverse section of the left ovary passed through a number of cystic cavities, of which the largest represented a dropsical follicle, the smaller cysts being filled with dendritic growths (see Fig. 334). As may be seen, the papillomata sprung from the surface of the ovary, having no connection with

[1] *Vide* Coblenz: *Virchow's Archiv*, Bd. lxxxii. S. 271.

the intra-cystic vegetations. Cross-sections of the ovaries in a similar case of bilateral papillomatous disease, described by Gusserow and Eberth,[1] disclosed nothing more noticeable than a few dilated and hemorrhagic Graafian follicles.[2] Histologically speaking, as well as in their development and clinical features, these superficial papillomata ovarii resemble the similar structures found in ovarian cysts; and it is probable that in both instances their origin may be ascribed to cells (epithelial?) which are genetically identical. Why the growths should in rare cases be thus limited to the ovarian superficies is as yet unknown; though Olshausen, basing his views upon recorded cases, is disposed to suggest as an etiological factor the irritating secretions of gonorrhœal salpingitis.

FIG. 334.



Transverse Section of the Left Ovary (LO) represented in Fig. 333, the incision following the line δε (Coblenz): *hfg*, dropsical Graafian follicle; *cp*, cysts filled with papillary vegetations; *bs*, pedicles of papillomata; *is*, interpapillary spaces; *pr*, papillary vegetations.

ETIOLOGY OF OVARIAN CYSTOMATA.—Unfortunately, but little is known as yet concerning the causes to which these proliferating forms of cystic disease of the ovaries may be imputed; and that little is of such a nature as to avail us nothing from a prophylactic standpoint. As a matter of fact, however, very little attention has been bestowed upon the subject, the operative, rather than the preventive, treatment of ovarian tumors in general having engrossed the professional mind since the advent of Listerism. The agencies which are usually regarded as taking a most active part in this connection may be classed as *predisposing* and *immediate* or *exciting*.

1. *Predisposing Causes.*—Chief among those mentioned under this head are age, chlorosis, the scrofulous diathesis, menstrual irregularities, marriage, parturition, sterility, and poverty. Of these, age has a most marked influence, the prevalence of the disease being greatest during the period of the most vigorous sexual activity, and rapidly diminishing as the extremes of life are approached. Thus the affection may occur as late as eighty or in early infancy. It was Doran's fortune, in examining the internal generative organs of a fœtus aged seven months, to discover in the left ovary three spherical cavities ranging from one-twelfth to one-sixteenth of an inch in diameter, each of which was lined with columnar epithelium and contained an abundance of dendritic growths identical with those found in post-natal cysts.

[1] "Grosse fibröse Papillome beider Ovarien." *Virchow's Archiv*, Bd. xliii.

[2] Compare Marchand, *op. cit.*; Birch-Hirschfeld, *Lehrb. d. path. Anat.*; J. Müller. *Ueber den feineren Bau und die Formen der krankhaften Geschwülste*, S. 541.

Within recent years another case has been described by Roemer,[1] in which a successful ovariotomy was performed upon a child twenty months old; while several others have been reported at an early age. The following table comprises 1713 cases observed by various authors:

61	cases	under	20	years.
440	"	between	20 and 30	"
499	"	"	30 and 40	"
371	"	"	40 and 50	"
342	"	over	50	"

The greater prevalence of the disease during the three decennial periods between the ages of twenty and fifty is shown by this table; though, aside from the fact that it is evidently most common after the age at which the majority of women marry, the causative influence of marriage is by no means demonstrated. Indeed, when the proportion of unmarried to married women is considered, a greater predisposition to ovarian tumors is, seemingly at least, exhibited by the former class. To what cause, then, may this increased ovarian disease of middle life be attributed? Largely, in all probability, to the effects of uninterrupted ovarian activity, this etiological factor becoming potent in the prime of menstrual life rather than in its earlier years, and affecting virgins as well as married women who have never borne children. When conception takes place ovulation ceases; and this ovarian repose, continuing throughout gestation and lactation, or a period ranging from eleven to twenty-one months, seems to act as a temporary safeguard against the occurrence of cystomata. "Thus," says Peaslee,[2] "it is the continuous ovarian activity of the never-parturient, and not the uterine activity with ovarian rest of the parturient, which becomes one of the most efficient of the predisposing causes of ovarian cystoma." In support of this view it may be added that out of 500 women afflicted with ovarian tumors, Boinet found 390 who had never given birth to children; while, according to Veit, the statistics of Lee, Scanzoni, and West show the proportion of sterile women to be 34 per centum. The observations of Scanzoni, Nussbaum, Olshausen, and Negroni,[3] however, apparently oppose this view. That parturition influences cystic degeneration of the ovaries seems hardly credible, when we consider the brevity of the process and the fact that it exerts no direct effect upon the ovaries. In the opinion of Clay, menorrhagia and amenorrhœa are largely responsible for these cystic growths, the latter of the two disorders being the more active. Other writers, again, believe that the disease is hereditary, and instances have been cited which seem to warrant the assumption. Thus, Olshausen states that

[1] *Deutsche medicinische Wochenschrift*, 26ten Dec., 1883.

[2] *Ovarian Tumors*, 1872, p. 90.

[3] Comp. "Aperçu sur l'Ovariotomie," *Thèse de Paris*, 1866.

in three instances he has operated upon two sisters, removing in each of the six cases a unilateral cystoma of the proliferating type. Rose has also observed the disease in two sisters whose maternal aunt was similarly afflicted; Simpson, in three sisters; while another author describes seven fatal cases occurring in one family.[1] That the connection between chlorosis and ovarian cysts is one of cause and effect, in the opinion of Scanzoni, we have already seen; and this view sheds some light upon the following statements by one of the most successful and experienced of ovariotomists, which otherwise sound somewhat paradoxical:[2] "Les femmes lymphatiques et nerveuses sont très sujettes aux kystes de toutes sortes. Dans les régions géographiques où le tempérament sanguin prédomine, les kystes de l'ovaire sont rare." That poverty, with its depressing consequences, predisposes its victims to the disease must, in Thomas' opinion, have become evident to every one of large experience.

2. *Exciting Causes.*—Considerable speculation concerning the immediate causes of cystoma ovarii has been indulged in, but, in the absence of convincing proofs, it has availed little, and our knowledge of this subject is even less satisfactory than of that just considered. Oöphoritis, direct violence, sexual excess, unsatisfied longings of a libidinous character, suppression of the menses, and other influences which might *a priori* be regarded as likely to excite this disease, have been adduced as etiological factors; while, in the production of the compound cystoma, the irritation due to a primary dermoid cyst has, within recent years, been assigned a prominent place. Hyperæmia and inflammation have been suggested as exciting causes by Scanzoni and Kiwisch respectively; but, though instances are on record in which cystomata have made their appearance after menstrual disorders or severe pain in the ovarian region, suggesting congestion and ovaritis, they are rare and do little to substantiate these views. Indeed, if the disease were to be ascribed to these causes it would certainly affect the left more frequently than the right ovary; since, for reasons of a purely mechanical nature, the former is decidedly more prone to hyperæmia and inflammation (Peaslee) than is the latter. This is due to the fact that while the right ovarian vein is supplied with a perfect valve at the point where it joins the vena cava, no such valve exists on the left side from its origin to its termination in the left renal vein. The similar anatomical construction of the analogous spermatic veins of the male accounts for the much greater frequency of varicocele on the left side than on the right. In point of fact, however, statistics seem to disclose a condition of things quite the reverse of that which mere theoretical reasoning would lead us to expect; and if any difference actually exists between the ovaries in

[1] *Vide* Lever: *Guy's Hospital Reports*, vol. i. p. 79.

[2] Koeberlé, *Les Maladies des Ovaires*, Paris, 1878.

respect to their liability to undergo cystic degeneration, it is in favor of the right. Thus, Clay found that of 850 cases of ovarian cysts examined by him, two-thirds were located on the right side, the balance on the left; while Tilt,[1] out of a total of 475 cases, observed the disease 260 times in the right ovary, 170 times in the left, and 45 times in both. Chéreau, Lee, Scanzoni, and Bloff also furnish statistics which support this view, 204 of the 403 cases of cystic tumors reported by them affecting the right ovary alone, 149 the left, while in 50 instances the disease was bilateral. These figures are the results of observations made during life, and, though confirmed in several instances by quite extensive post-mortem records, such confirmation has been but partial—a fact which seemingly justifies the inference that in all probability the actual difference between the ovaries in this respect is very slight.

Histogenesis and Development of Ovarian Cysts.—A chronicle of the results attending the laborious efforts of a long list of patient investigators, whose self-imposed task has been to trace back to its very beginning the formation of ovarian cysts, would disclose the fact that the subject is apparently in a less satisfactory condition now than in the early part of the present century; the idea that all cysts were developed from Graafian follicles, which then obtained, being supplanted by the numerous, and oftentimes antagonistic, views of to-day. Virchow[2] was the first to distinguish between hydrops follicularis and the proliferating cystoma, claiming that the latter originated in a colloid degeneration of the ovarian stroma rather than from the epithelial elements of the gland; in which view he has been supported by Förster, Klob, and, in part at least, by Mayweg.[3] According to Förster, the connective-tissue corpuscles of the ovary proliferate and form aggregations of embryonal-like cells, the most internal of which undergo colloid degeneration and are destroyed, while those more peripherally disposed remain and constitute the epithelial lining of the cystic cavity. Of the three varieties of ovarian cystoids—that is, tumors composed of one or more cysts—recognized by Rindfleisch,[4] he ascribes the origin of two to the Graafian follicles, while the third (colloid cyst-adenoma) is, in his estimation, to be likewise referred to this colloid metamorphosis of the ovarian tissue. Sections cut from the more solid portions of a cystoma belonging to the last-mentioned group, whether they were taken from its outer investment or represented a portion of the internal framework of the tumor, were rarely found to present a uniform, unbroken surface of well-organized con-

[1] *The Lancet*, Dec., 1849; Feb. and March, 1850.

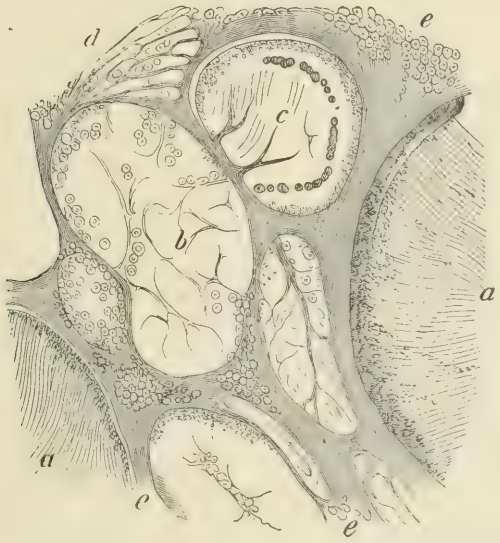
[2] "Das Eierstockscolloid," *Verhandl. d. Ges. f. Geb. in Berlin*, Bd. iii., 1848, S. 197.

[3] Consult Förster, *Lehrb. d. path. Anat.;* Klob, *Path. Anat. d. weibl. Sexualorg.*, 1864; Mayweg, "Entwickelungsgeschichte der Cystengeschwülste des Eierstocks," *Dissert. inaug.*, Bonn, 1868.

[4] *Op. cit.*, p. 470.

nective tissue, cysts of various sizes appearing, the most minute of which required the microscope for their detection. The lumina of the smaller cysts were traversed here and there by delicate connective-tissue fibres, no special wall or epithelial lining being perceptible. Such a section is shown in the accompanying Fig. 335. It will be observed that groups of small, round cells (*e*), suggesting inflamma-

Fig. 335.



Colloid Degeneration of the Stroma in an Ovarian Cystoma (Rindfleisch): *a*, larger cysts, partially lined with low cylindrical epithelium, and with radial cleavage of their contents due to hardening; *b*, more recent cyst, without epithelium, and traversed by fibres of connective tissue; *c*, the same, containing a row of detached epithelial cells; *d*, colloid infiltration of the connective tissue, from which a cyst has not yet developed; *e*, infiltration of the stroma with small cells. (Enlarged 200 times.)

tory irritation, appear in the stroma; and Rindfleisch is undecided whether to attribute the genesis of the cysts primarily to the colloid degeneration of these cells or of the connective tissue itself. The epithelial lining of the cystic cavities is formed later. Doran describes similar cavities, which under an inch objective appeared like foci of colloid degeneration; while a high power disclosed the presence of a lining made up of long, cylindrical epithelial cells. Connective-tissue processes extended into the cystic cavities, crossing in some instances from wall to wall. Such appearances have often been mistaken for colloid degeneration of the stroma; though Doran is disposed to regard them as obstructed diverticula of the larger cysts, the epithelium in both being similar. These facts show the necessity of distinguishing extra- from intra-follicular colloid growths.

Not only does the colloid metamorphosis manifest itself in the

stroma, follicles, and corpora lutea, according to various pathologists, but the walls of the large blood-vessels in the ovary may likewise undergo this peculiar degeneration. It was Noeggerath who first suggested that disease of the latter structures might terminate in the formation of ovarian cysts.[1] This observer, in his studies of ovarian tissue, met with peculiar branched structures which he recognized as altered and enlarged blood-vessels, and which bore a striking resemblance to the tubes of Pflüger as depicted by Waldeyer (see Fig. 320); indeed, it required but a slight exercise of the imagination (as Noeggerath expresses it) to convince one of the identity of the two formations. The changes in the blood-vessels which were supposed to be the result of an endoarteritis destruens consisted in hyperplasia of the middle coat with atrophy of the tunica intima, the muscle-fibres of the arterial wall becoming metamorphosed into epithelioid cells, and, later, into true cylindrical epithelium. Thus the cyst, occupying the distended lumen of the diseased vessel, derived its cellular lining from the muscular coat, or possibly from the altered endothelium. According to Noeggerath, many cysts of the adenoma-cylindro-cellulare type possess this angiomatous genesis, and thus merit the designation "angiomata cystica."

The views concerning the histogenesis of ovarian cystomata thus far considered, and to which the theory of Noeggerath is allied, are, as we have seen, directed to the dermoid or connective-tissue portion of the gland as the starting-point of the disease; but, on the other hand, the great majority of more recent writers favor its purely epithelial origin, though differing as to the precise nature and condition of the parenchymatous structure to which such origin may be ascribed. Among those who regard the Graafian follicles as the sole starting-point of the cysts are Ritchie, Wells, Tait, Doran, and Fernbach.[2] In Tait's opinion ovarian cystomata are the result of follicular dropsy only; but what determines the special type of tumor thus formed? Why should a proliferous cyst rather than a multiple cystoma be produced by the operation of the same cause? The answer to these queries has been sought in the anatomical distinctions which exist between the two growths. In the loculi of Rokitansky's tumor, or the multiple cystoma, ova are found, and the epithelium does not differ from that lining the Graafian follicle; while in the proliferating cystoma the ovules are absent, and the epithelium has undergone marked changes. As De Sinéty and Malassez remark: "The epithelium in these new formations shows every possible variety; but in none, not even those which simulate the Graafian follicles, have we found any epithelium similar to that of the follicles, neither have we ever found any ovules in their interior." While these authors are

[1] Noeggerath on "The Diseases of the Blood-vessels of the Ovary in Relation to the Genesis of Ovarian Cysts," *Amer. Journ. of Obstet.*, vol. xiii. 1880.

[2] "Ueber die Genese der Eierstockscysten," *Dissert. inaug.*, Breslau, 1867.

disposed to attribute this destruction of the ovum and the epithelial transformation to the excessive dilatation of the follicle, Tait claims that in so doing they are probably substituting the cause for the effect; the changes, and particularly those affecting the epithelium, being the occasion, rather than the result, of the cystic enlargement. Whether the epithelial changes follow or precede the destruction of the ovum is not yet definitely determined; though the tendency of those who refer the origin of ovarian cysts to the mature follicles is evidently to favor the former view, they believing that the follicular epithelium returns secondarily to the young, immature, or fœtal type, in which the tendency to proliferate is so marked. The development of ovarian cysts from the dilated Graafian vesicles is simply and attractively explained by Tait, who cites in support of his theory, and by way of illustration, the phenomena attending soap-bubble blowing. "If the fluid be not viscid enough to enable the cells to retain their form," says that writer on ovarian diseases, "then the normal condition of the ovary is represented, its cells bursting and disappearing. Let us suppose that the cell-growth is constantly going on, and that some alteration occurs in the state of matters which prevents the cell-walls bursting; the fluid in the basin is so viscid that the cells do not break, and bubble after bubble is formed, some larger, some smaller, until a large multicystic tumor is the result. The actual appearance of the cystic ovary may be very well imitated in the basin of soapsuds. A large cyst can be made with little ones crowding into it, looking like its offspring, and the walls between two or three may be broken down, making one larger multilocular tumor—the remains of the intervening walls not being left in the instance of the soap-bubbles. . . . . In the ovary we have the continual production of cells, representing the continuous blowing of the bubbles; and we have only to discover what it is that is analogous in the ovary to the increased viscidity in the solution of soap—what it is that keeps the cysts in their entirety, perverting a physiological into a pathological process." The conclusion at which Doran arrives as the outcome of repeated painstaking examinations of human ovaries—fœtal, infantile, and adult—refer the origin of multilocular cysts to the ovisacs also, it is true, but to those which have undergone partial atrophy; indeed, this author avers that evidence is strongly opposed to the theory which would ascribe even the occasional genesis of the disease to dilated mature follicles. Instead of completing the physiological cycle and forming corpora lutea of menstruation or pregnancy, many of the follicles fail to ripen, development giving place to a retrograde metamorphosis marked by atrophy. The ultimate result of the atrophic process would be the formation of dense, cicatricial, semi-opaque bodies called corpora fibrosa;[1] and even these

[1] *Vide* Patenko: "Ueber die Entwicklung der Corpora fibrosa in Ovarien." *Virchow's*

may disappear later, leaving no trace of the original ovisacs. Doran believes that in some cases this atrophy is interrupted by certain unknown influences, and that the follicular epithelium, provided any has survived the preceding retrograde process, then proliferates exuberantly. The supervention of colloid degeneration in the newly-formed epithelial cells accounts for the intra-follicular colloid deposits, which Doran recognizes as the early stages of cystic disease. The secondary loculi of cystic adenoma and papilloma also result from the proliferation of the epithelial lining of these single cysts, according to Doran, the process being identical with that which we are about to describe. Still another theory has been propounded by Waldeyer[1] and Klebs to account for the formation of the proliferating cystomata, which concerns the tube-like collections of germinal epithelium within the ovarian stroma, first described by Pflüger (see Fig. 320), and destined to develop later into Graafian follicles. Thus, instead of attributing the origin of these ovarian cysts to ovisacs already formed and in either a mature or undeveloped state, as do the authors just considered, Waldeyer goes back still farther in the life-history of the intra-ovarian germ-epithelium—to the ante-follicular period, in fact, when the tendency to proliferate and form abnormal growths is even more marked. The formation of the primary cyst is ushered in by the appearance of a space in one of the masses of germinal epithelium constituting the tubes of Pflüger; which space is apparently formed by a dilatation of its lumen. At the same time the surrounding cells, forming the wall of the cyst, begin to proliferate much more rapidly than would suffice to merely line the growing cystic cavity, and, after the manner of secreting membranes in general, which undergo extension by inversion or recession, invade the cyst-wall in the form of small, gland-like tubes resembling those of the uterus and having either blind or inosculating extremities. These tubes, which are perpendicular to the inner surface of the primary cyst, pursue a straight course usually, though they may divide dichotomously. Transverse sections of such a cyst-wall resemble those of the intestines or stomach, where the tubular outgrowths of epithelium are numerous and close together; though, as their distribution over the surface of the cyst is irregular, these processes may in places be few in number and widely separated. The epithelium of these glandular formations, as well as of the parent-cyst, degenerates into or secretes the peculiar colloid material which is so characteristic of the cystoma proliferum glandulare; and, should the mouths of the tubes become occluded by pressure, actual fusion, or because of the

Archiv, Bd. lxxxiv. S. 193; also Beigel, "Zur Naturgeschichte des Corpus Luteum," *Archiv für Gynäkologie*, Bd. xiii., 1878.

[1] "Die Epithelialen Eierstocksgeschwülste, insbesondere die Kystome," *Arch. f. Gynäk.*, Bd. i. S. 252.

density of the fluid, they are converted into cysts. Thus retention-cysts develop in the wall of the mother-cyst. From the inner surfaces of these secondary loculi, tertiary are formed in the same manner; and thus the process may be repeated *ad infinitum*, resulting in the formation of a proliferating cystoma having a multitude of compartments (Fig. 336). Further alterations in the tumor, as we have seen in a previous section, are largely the result of the coalescence of these secondary cysts, mutual pressure causing the atrophy and disappearance of their contiguous walls, with the final production of one or more cavities of large size.

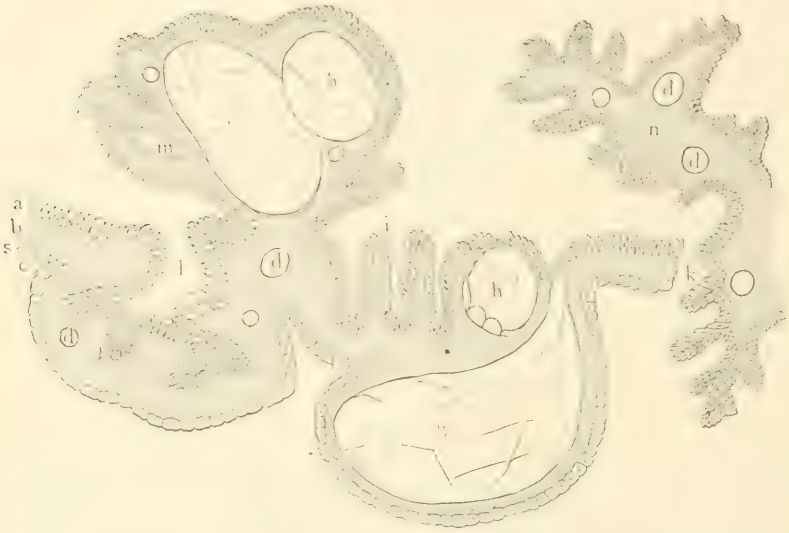
FIG. 336.

Section of the Wall of a Proliferating Glandular Cystoma (enlarged about 30 times): *a*, outer fibrous layer; *b*, inner cellular layer, covered with cylindrical epithelium; *c*, larger glandular tubes; *d*, small, very recent, tube-like structures; *e*, small secondary cysts; *f*, glandular tube with cystic enlargement of lower end; *g*, glandular tube with forked extremity (Waldeyer).

While this cystic proliferation is the result of the energetic growth of the epithelium, it is accompanied with hyperplasia of the stroma, sufficient at least to provide a proper investment of connective tissue for the tubular offshoots of epithelium, as well as for their cystic enlargements. Instead of, or in addition to, these glandular processes, papillæ and variously shaped papillomatous excrescences may appear within a cyst, besetting a part or even the whole of its surface, and being in some instances of such exuberant growth as not only to completely fill the interior, but to perforate the wall of the sac as well. When these papillomatous, rather than the glandular, growths predominate in a neoplasm, Waldeyer distinguishes it as a "proliferating papillary cystoma." Whether the papillary structures owe their origin to

the inward proliferation of the epithelium, accompanied perforce with its matrix (Fritsch), to the primary hyperplastic development of the stroma, forcing before it the epithelial lining of the cyst (Waldeyer), or whether they represent the passive results of adjacent gland-formations (Boettcher),[1] are questions of secondary importance. In any case, the formation of secondary cysts is probably due to the coalescence of the free ends of the papillary excrescences, as described by Fox,[2] the closed interpapillary spaces thus formed becoming filled with the colloid secretion of the epithelial cells. The development of secondary cysts from both the papillary and glandular formations is well illustrated in the accompanying wood-cut (Fig. 337). Waldeyer's view of

FIG. 337.



Schematic Diagram illustrating the Development of an Ovarian Cystoma (Fritsch): *a*, lining of cylindrical epithelium; *b*, fibrillar connective tissue of cyst-wall; *c*, germ-epithelium; *d*, blood-vessels; *e*, *h*, two interpapillary cysts united by pressure-atrophy of intervening septum; *h*, cyst formed by cohesion of papillary extremities and colloid degeneration of epithelium; *i*, glandular tubes formed by recession of proliferating epithelium; *k*, papillomatous mass which has perforated the cyst-wall, *n* and *o* representing the intra- and extra-cystic portions respectively; *l*, branched adenomatous recess, due to epithelial proliferation; *m*, incipient interpapillary cyst: *g*, secondary cyst at a more advanced stage than *h*.

the histogenesis of ovarian cystomata is supported by De Sinéty and Malassez, who refer the beginning of many cysts to tubular ingrowths of germinal epithelium, either normal or pathological (*enfoncements pathologiques*), which they regard as the precursors of Pflüger's tubes.

It was assumed by Pflüger himself that the egg-tubules were not

[1] "Beob. über die Entwick. multiloc. Eierstockscysten," *Virchow's Archiv*, Bd. xlix. S. 298.

[2] *Vide* Wilson Fox: "Cystic Tumors of the Ovary," *Trans. Roy. Med.-Chir. Soc.*, 1864.

merely a feature of the fœtal ovary, but that they continued to form in later life; and the fact that these structures have been discovered in the ovaries of children and adults by Spiegelberg, Köster, Langhans, and others, together with the marked prevalence of the cystomata during adult life, would seem to warrant Olshausen's assumption that the development of these growths may begin at any period of life, and then from newly-formed tubules. However, such an explanation seems superfluous. We know absolutely that ovarian cysts, in either a rudimentary or advanced state, have been observed in the fœtus; and should the tubes of Pflüger fail to undergo the normal conversion into follicles during the intra-uterine or early infantile stages, their persistence in later life would account for the subsequent development of the cystomata. Indeed, the very influences determining such a persistence of the egg-tubes might prove potent factors in effecting their cystic degeneration. Of the various theories which we have just considered respecting the histogenesis of these cystic growths, it is probable that all are to some extent true; though the burden of evidence certainly seems to be in favor of their development from fœtal structures in the majority of cases. In support of the view first advanced by Olshausen, that papillomatous cysts arise from the parovarian structures within the ovary, and are therefore genetically distinct from the glandular variety, we have the testimony of Doran. This observer has in several instances met with papillary cystomata springing from the medullary strands in the ovarian hilum, and resulting in the displacement, rather than in the invasion, of the glands, the normal outlines of which were preserved. In the left ovary of a seven-month fœtus also Harris and Doran[1] found a row of three cysts, varying in diameter from one-twelfth to one-sixteenth of an inch, filled with characteristic papillomatous growths, and traceable, genetically, to the Wolffian structures. Fischel[2] also indorses this view, though in a modified form, by referring the origin of these papillary cysts to the cells of the membrana granulosa, which, with Kölliker, he believes to be of Wolffian origin. According to Marchand[3] and Flaischlen,[4] on the other hand, both the papillary and glandular cystomata originate in the germ-epithelium, though differing in their subsequent development. This latter view, however, is far from being satisfactory, inasmuch as it does not account for the increased malignance, extra-peritoneal development, and bilateral occurrence of the papillary cysts. A strict separation of the two varieties of proliferating cystic tumors is hardly possible, however, since in exceptional cases papillomatous and glandular structures coexist in the same multilocular growth, and even

[1] "The Ovary in Incipient Cystic Disease," *Journ. of Anat. and Phys.*, vol. xv.

[2] "Ueber Parovarialcysten und parovarielle Kystome," *Arch. f. Gynäk.*, Bd. xv.

[3] *Op. cit.*

[4] *Zeitschr. f. Geb. u. Gyn.*, Bd. vi. und vii.

in the same loculus, together, it may be, with various forms of degeneration, including the cancerous.

The Walls of the Cystomata.—When exposed to view in the course of a laparotomy, the main wall of a typical multilocular cystoma usually presents a smooth, glistening surface of almost silvery whiteness; though this appearance is altered at points where secondary cysts have developed within the wall, or where inflammatory and other changes of a degenerative character have taken place. Such a wall, varying in thickness from one-fourth to ten millimeters, is made up principally of fibrous tissue, the outer and inner surfaces of which are bounded by the peritoneal and epithelial layers respectively. The middle or proper layer has been divided into from one to six laminæ by different observers, the number depending upon the skill of the dissector rather than upon definite anatomical distinctions. The wall being thinnest at a point opposite the pedunculer attachment of the cyst, and thickest in the latter situation, the ease with which the above separation can be effected increases as the pedicle is approached. When three lamellæ can be demonstrated, the middle one is found to be made up of loose connective tissue, while the outer and inner layers are of a denser fibrous structure. The large arteries supplying the cyst-wall are found in the middle layer, and distribute their capillaries principally to the subepithelial stratum. The veins, which may reach the size of one's little finger,[1] mainly occupy the outer stratum. Smooth muscle-fibres also occur in abundance, especially near the pedicle and in the neighborhood of the blood-vessels; while nerves and lymphatic vessels ramify throughout the walls, the latter being of considerable size and well valved in the pedicle. According to Waldeyer, the main wall and those of the larger secondary cysts possess two layers: an external one, composed of dense connective tissue, having parallel fibres and containing but few cells; and a much thinner internal one, rich in cells and blood-vessels, upon which rests the epithelial lining of the cyst.[2] (See Fig. 336.) These layers correspond to the tunica fibrosa and tunica propria of the larger ovisacs, while the epithelium may be compared with the membrana granulosa. In smaller cysts the tunica propria alone is present, just as in the early stage of a Graafian follicle. Oftentimes the tunica externa may be subdivided into several layers separated by loose connective tissue, and of these the inner are always more cellular than the outer.

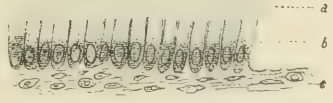
The epithelial lining of the cysts is composed almost invariably of columnar cells; though in consequence, probably, of the eccentric pressure exerted by the fluid contents, these approach the pavement type in the larger sacs. Ciliated cells have also been observed. As a rule,

[1] *Vide* T. S. Lee: *Tumors of the Uterus*, p. 13, London, 1847.

[2] *Vide* Waldeyer: *Archiv f. Gynäk.*, Bd. i. S. 252.

but a single epithelial layer is present; Boettcher, however, describes the occurrence of several superimposed strata. When in a fresh state the epithelium appears as a delicate mosaic, of which the individual cells are distinguished almost solely by their beautiful vesicular nuclei, while the nucleoli are small and often wanting altogether. The protoplasm of the cells, besides being quite pale and of a finely granular character, is very soft, resembling the adjacent colloid; while the borders of the cells are disclosed by the action of acetic acid. The nuclei occupy the lower or attached ends of the cells, and the protoplasm immediately surrounding them is darker and more coarsely granular than in the free ends (Fig. 338). This deep, perinuclear protoplasm takes

FIG. 338.



Portion of the Internal Wall of a Glandular Cystoma (enlarged 300 times): *a*, colloid mass; *b*, cylindrical epithelial cells, the free ends of which are open; *c*, innermost layer of connective-tissue substratum (Waldeyer).

with carmine a much more intense stain than does that more superficially disposed, the latter often remaining clear and exhibiting a homogeneous mucus-like nature, resembling the colloid contents of the cysts. In sections of preparations which have been hardened in alcohol the boundaries of the cells always show, while the upper ends seem to be open. Thus the cells may resemble long, narrow goblets (beaker- or chalice-cells). Frequently these goblet-cells are of the ordinary form, having markedly swollen bodies and homogeneous mucous contents. The epithelial investment of the ovary terminates in a white, irregular, and somewhat elevated line, which encircles the base of the gland and marks the boundary between epithelium and serous membrane. Accordingly, should a small tumor develop on the distal side of the boundary-line and enlarge at the entire expense of the ovary, it will be seen that its outer surface would be covered with a layer of germ-epithelium. As a matter of fact, however, the cystomata in their growth practically displace the ovary, or they expand in a forward direction, invading the broad ligament and becoming extra-peritoneal. In either case the outer surface of the tumor is almost completely invested by the peritoneum, this membrane being always replaced at some point, however, by the low columnar or cubical epithelium of the distended and flattened ovary. The site of the ovary usually occupies the upper and anterior portion of the cyst-wall, and is differentiated from the surrounding serous membrane by its lighter color and diminished vascularity. At times, however, a few anasto-

mosing blood-vessels, radiating from the surrounding peritoneum, are observed coursing over this ovarian area.

Upon the surface of ovarian cysts, which in other respects are quite healthy, there may usually be seen numerous patches of a red color, due to the ectatic condition of the blood-vessels, besides smaller areas, denuded of their epithelium and presenting a comparatively blue and dull appearance. Small pedunculated outgrowths from the main wall have been observed by Doran at points considerably removed from the pedicle of the tumor; and the same author also directs attention to thin-walled cysts of inconsiderable size and lined with endothelium, which, forming in the cyst-wall, appear externally as rounded protuberances. These are the homologues of similar cysts of intra-ligamentous development. Of these excrescences on the outer surface of the cystomata De Sinéty and Malassez lay special stress upon two varieties—the "connective-tissue" and "mixed" types. The connective-tissue growths are of frequent occurrence, and appear either in the form of flattened, elevated, opaque patches of dense fibrous tissue, or as small, discrete nodules of young connective tissue, mixed with cysts of minute size. The writer also has had occasion to examine growths of the latter variety. The "mixed" growths of these French authors frequently appear as small, red, fleshy caruncles or wattles, which are covered with low cubical epithelium and resemble strongly the fimbriæ of the Fallopian tube; indeed, the assumption that they are developed from the laciniæ is supported by the fact that ciliated epithelium has occasionally been found upon them. Distinct from all these are the papillæ and papillomatous masses, which have already been sufficiently described. Waldeyer states that the round and often terraced depressions or erosions which are sometimes found on the wall of the main cyst, and particularly on its anterior aspect, are to be regarded as the effects of friction between the neoplasm and the abdominal parietes.

Among the secondary changes of a retrogressive nature to which the walls of an ovarian cystoma are exposed may be mentioned the following: fatty degeneration, calcification, ossification, atheroma, and infarctions. Of these, the first is probably invariably present, though varying in degree, and is characterized by the direct metamorphosis of the albuminoid constituents of the tissues into fatty material, the result being the destruction of the histological elements and the softening of the intercellular substance. Both the epithelium and the connective tissue of the walls are affected, their softening and dissolution being followed by the appearance of fat and cholesterin in the fluid contents of the cysts. This retrograde change is favored by intra-cystic pressure, torsion of the pedicle, disordered conditions of the blood, and such other causes as interfere with the nutrition of the cyst-walls. Calcification affects the inner stratum of the main wall chiefly, the

lime-salts being deposited in the form of granules or laminæ, which are generally separated from the epithelial lining by a thin layer of connective tissue. The rapidity with which this calcareous infiltration of the diseased tissues is effected varies with the nutrition of the growth, and may become very marked in cases where this is interfered with; indeed, in a case of torsion of the pedicle, reported by Leopold, the tumor, which was as large as an orange, had undergone almost complete calcification. Occasionally, true bone is found in the walls of ovarian cysts, such a heterologous growth being due to simple metaplasia of the pre-existing fibrous tissue.[1] Atheroma affects the inner layers of the cyst-wall principally, and usually results in the destruction of the epithelium lining the diseased areas. The so-called infarctions observed by De Sinéty and Malassez in the septa of ovarian cysts consisted of whitish, opaque patches, each of which was invested by a red zone of hyperæmic tissue, and made up of granular matter, connective-tissue fibrils, white blood-globules, and other cells.

The Contents of Ovarian Cystomata.—Every glandular secretion is, in general, composed of two parts: a simple transudate, contributed directly by the vascular system, and certain special ingredients, selected or elaborated from the blood by the cells, which are the chief agents in the process. The cells yield up their contents in the form of an exudation, or the fulfillment of this special function involves their own immediate construction, since in the latter instance they either burst or become detached in an entire state from the basement membrane. Upon the nature and amount of the material thus supplied by the cells depends the special character of the secretion. In the cystomata resulting from the atypical proliferation of the glandular epithelium of the ovary, likewise, the peculiar contents of the sacs are largely the production of the lining cells, and represent the products of their degeneration. The epithelial cells either undergo *in toto* a colloid, myxoid, or paralbuminoid metamorphosis, or only a part of their protoplasm is for a time so changed (goblet-cell form). In the latter case it is probable that each of the goblet- or beaker-cells acts for a time as a minute unicellular gland before perishing. Under the microscope the intra-cystic colloid material is seen to be continuous with that within the goblet-cells—a fact which demonstrates its cellular origin. (See Fig. 338.) This metamorphosed protoplasm of the epithelial cells, when liberated, swells in the vascular transudate, and either dissolves or remains suspended in the form of a fine emulsion, its amount determining the density of the resulting fluid. That the epithelial cells are thereby sacrificed is proved by the fact that they occur in the colloid substance, either in a whole state as round, bright, vesicular

[1] *Vide* Fürst: "Knochenneubildung in der Wand einer Ovariencyste," *Virchow's Archiv*, Bd. xcvii. S. 131.

structures, or as cellular remnants of the most variable size and form. Newly-formed cells rapidly replace those which have thus performed their office.

Ranging in specific gravity from 1010 to 1050, and of a neutral or alkaline reaction, the contents of the ovarian cystomata vary greatly in consistency; and that not in different tumors merely, but in the various loculi of the same growth as well. Thus we may find a clear, serous liquid present which flows freely through a cannula, or a thick, gelatinous substance, the removal of which necessitates the use of the hand; while between these extremes are fluids more or less viscid and ropy, having the consistence of honey or oil, and frothing when well shaken. As a rule, the fluid becomes thinner as a sac increases in size and age, this change being accompanied with alterations in its epithelial lining, the cells of which approach the squamous type more and more. That the ever-increasing intra-cystic pressure accounts for this epithelial flattening in a great measure is doubtless true; but to what extent is the elastic extension of the cell-protoplasm, rendered necessary by the growth of the underlying wall, responsible for the change? Most of the proliferating glandular cystomata, however, are filled with the viscid and gelatinous material, the density of the contents being usually greatest in multilocular (polycystic) tumors of the parvilocular (microcystic) type. In the gelatinous contents of some of the larger sacs, formed by the coalescence of several smaller ones, a close examination will disclose the presence of columnar divisions, corresponding in number to the original loculi, and surrounded in each instance by a thin, whitish layer composed of degenerate epithelia and their disintegrated, fatty remains. These represent the walls of the original cysts, destroyed by mutual compression; and in rare instances one may also find blood-vessels, survivors of the destroyed septa, lying free in the jelly-like or colloid substance. It is possible that these vessels may be the source of spontaneous hemorrhage occurring in the cysts. In the papillary cystomata the fluid is usually thinner and devoid of a glairy or ropy quality.

Hemorrhage or suppuration of the cyst-walls may occur, and occasion marked changes in the appearance of their contents; indeed, the greatest variety of tints, ranging from the lightest gray through the various shades of green, yellow, brown, and red to an intense black, may thus be produced. Of these the dark colors are due to the presence of blood; while pus is more apt to enter largely into the composition of the fluids of lighter color, including the various shades of yellow. Cholesterin imparts a peculiar greenish shimmer to the contents of a cyst, and when very abundant may appear in the form of dense whitish clouds. Spontaneous coagulation never occurs in the fluid of the cystomata, except considerable blood be present; in which case, of

course, fibrinous clots may form. In ascitic fluid, on the other hand, coagula usually appear after the former has stood for from twelve to forty-eight hours. According to Spiegelberg, this constitutes a reliable diagnostic criterion of ascitic fluid; though, inasmuch as spontaneous coagulation of the contents of ovarian cysts has been observed by Martin, Westphalen, Klob, and Scanzoni, it is probable that such is not the case.

A. *Chemical Composition.*—The amount of solid material found in the fluid of the ovarian cystomata varies greatly in different specimens; though such fluctuations are to be ascribed to the organic ingredients (2.5 to 140 parts per 1000) rather than to the salts, the latter remaining nearly constant in amount (7 to 9 parts per 1000). The proportion of these solids seems to exert but a slight influence, however, upon the consistency of the cyst-contents. Proteids or albuminoids, fats, and salts are always present; and among the substances of less frequent occurrence are cholesterin, leucin, ammonia, cystin, allantoin, urea, and indican. The last-named ingredient was found in one case by Garrigues.[1] It is to Eichwald's[2] elaborate researches, however, that we are largely indebted for our present knowledge concerning the various chemical transformations which take place in the fluids of these cysts. According to this writer, these changes are of two kinds, and occur simultaneously, their products forming two series of substances —the *mucin* and *albumen* series. Of these, the former predominate in the contents of more recent cysts, while in larger and older sacs the latter are in excess. The mucin, which is derived from the metamorphosed protoplasm of the epithelium that has undergone colloid degeneration, is gradually transformed into muco-peptone, the products intermediate between the mucin and muco-peptone being termed colloid. Thus colloid degeneration simply means a mucous metamorphosis. The various substances of the mucin series—that is, first, the metamorphosed protoplasm of the lining cells; second, mucin; third, colloid; and fourth, muco-peptone—deport themselves differently in water and various other reagents. The first is soluble only in dilute alkaline solutions, the second dissolves in solutions of the alkaline earths and swells in water, while both may be entirely precipitated with acetic acid. The third, or colloid, is partially soluble in cold, still more in hot, water; and acetic acid produces a cloudiness, but no real coagulum. Finally, the last member of the series, or muco-peptone, dissolves with extreme readiness in water; though in contact with acetic acid no precipitation whatever ensues.

The albumen, which is derived from the blood, occurs in the contents

[1] *Vide* Garrigues: *Amer. Journ. of Obstet.*, vol. xv. p. 1; also, "Diagnosis of Ovarian Cysts by Means of the Examination of their Contents," Wm. Wood & Co.

[2] "Colloidentartung der Eierstöcke," *Würzburger med. Zeitschr.*, Bd. v. S. 270.

of colloid ovarian cysts in two forms—free albumen and the albuminate of soda; though the changes which result in the albumen series of substances affect the former only, the albuminate remaining unchanged. The former of the two also is coagulated simply by boiling, while the latter requires the previous addition of an acid. The free albumen in the loculi of an ovarian cyst, then, undergoes a gradual transition into albumino-peptone; and while the intermediate products are many in number, but two are recognized; these being fairly representative of the qualities of the rest, though not in themselves of a constant and definite composition. As its metamorphosis progresses the albumen at first ceases to coagulate when heated; that is, it becomes converted into paralbumen. Gradually, a later stage is reached in which the mineral acids fail to cause any precipitation, and to such a product is applied the term metalbumen. The albumen series therefore is composed of, first, albumen; second, paralbumen; third, metalbumen; and, fourth, albumino-peptone. The properties of each of these four substances are identical with those pertaining to the corresponding members of the mucin series, though they are distinguished from the latter by the facts that they contain sulphur and are precipitated by tannin and neutral metallic salts. The effect of boiling upon the fluid contents of cysts varies with the amount of free albumen present. Thus, the fluid may remain quite clear if all the free albumen has already been metamorphosed; though, from the fact that the albuminate of soda is constantly present, the previous addition of an acid always results in a cloudiness due to precipitation.

This gradual conversion of mucin and albumen into soluble peptones, such as are found in the digestive tract, is the result of obscure causes. The process has been attributed to a sort of slow digestion promoted by the sustained heat of the body (Eichwald, Rindfleisch), though no special ferment has as yet been discovered. We have thus learned that the thin fluids found in the larger and presumably older cysts result not only from changes in the lining epithelium of the sacs, but from this transformation of the albuminous and mucous ingredients into soluble compounds. To test ovarian fluid for paralbumen it is permitted to stand for a time in a cool place, and is then passed through a filter or decanted. Through the clear liquid thus obtained a current of carbonic acid gas is passed, which at once precipitates the paralbumen in the form of fine flocculi. The diagnostic value which may be attached to the discovery of paralbumen in fluids removed by exploratory puncture from the abdominal cavity is not yet definitely determined. In the first place, it is not of constant occurrence in ovarian tumors, not even in the proliferating cystomata, though in the latter its absence is comparatively rare. Again, paralbumen has been found in a cervical cyst, in the sputum of bronchitis, in a sacral tumor of fœtal

origin, in the urine, and in ascitic fluid, showing that it is by no means confined to the diseased ovary. It is possible, however, that the cases of ascites were due to ovarian cysts; and in that case the paralbumen might have been derived from the tumors.

Analysis of ovarian fluids affords variable results, but the following example will serve to convey an idea of their composition (Eichwald):

Water		931.96
Organic substances		59.77
Salts soluble in water:		
Potass. sulph.	0.08	
" chlor.	0.59	
Sod. chlor.	6.29	
" phos.	0.16	
" carb.	0.38	
Loss	0.03	7.53
Salts insoluble in water		0.74
Total number of parts		1000.00

B. *Microscopical Composition.*—When the contents of ovarian cysts are examined with the aid of a microscope having a magnifying power of from 300 to 600 diameters, various morphological structures are observed in a comparatively homogeneous medium of greater or less fluidity. These formed elements vary in number, being generally more numerous in the thicker colloid fluids; indeed, in some of the latter they may be present in such excess as to cut off the light, when a free dilution with water is necessary to bring into view the contours of the individual elements. These may be the following:

1. *Epithelial cells*, from the lining of the cyst, which, when intact, are important aids in forming a diagnosis. Frequently, however, they have undergone more or less fatty change. Besides these single cells the epithelium may appear in flakes of various sizes, produced by the exfoliation in patches of the cellular cyst-lining; while masses of sprouting cells, when present, are suggestive of cancerous changes.

2. *Fat*, in the form of granules of various sizes, ranging from minute, dust-like particles to globules of considerable size. These granules may be free and more or less isolated, or massed together in globular form and supported by a homogeneous substance. In either case they are largely the result of the fatty degeneration and disintegration of cells.

3. *Cells and nuclei* which have undergone colloid degeneration and are represented by large, transparent, colorless globules. These characteristic shining elements, when subjected to the action of the compressor, burst and tear in a radial direction; so that each of the flattened disks is divided into a number of sectors (Wells). Instead of having clear, transparent, homogeneous surfaces, some of these globules may be

more or less completely studded with dark granules; or the latter may occur in groups, of which a single colloid globule may contain as many as ten.

4. *Numerous small, round corpuscles*, containing dark molecular matter or larger strong-refracting granules, and similar in appearance to the pyoid bodies of Lebert or the exudative cells of Henle.

5. *Blood-corpuscles*, either normal or changed in shape.

6. *Horny epithelium*, in the form of flat scales.

7. *Pigment*, in granules of different sizes, which are either isolated or in groups, and may be imbedded in the colloid globules. This is derived from the coloring matter of effused blood.

8. *Cholesterin*, in the characteristic rhombic tablets.

9. *Leucocytes* or *pus-corpuscles*, due to inflammation and suppuration of the cyst-wall, and frequently in a state of fatty degeneration.

10. *Villi*, in a fragmentary or intact condition, and derived from the papillomatous outgrowths on the inner surface of the cyst.

Considerable importance has been attached to the "ovarian granular cell" of Drysdale, which was regarded by its discoverer as pathognomonic of ovarian disease when found in the contents of pelvic tumors.[1] Of almost invariable occurrence in ovarian fluid, this non-nucleated, round, or slightly oval cell presents a very delicate transparent appearance, and contains a number of fine granules having clear, well-defined contours. Though by no means of uniform dimensions, the ovarian cell commonly resembles the pus-corpuscle in point of size; but its behavior with acetic acid serves to distinguish it not only from the latter, but from the lymph-corpuscles, leucocytes, and other similar cells. Under the action of this acid the cells just mentioned increase in size and transparency, while from one to four nuclei appear in each. Under the same circumstances, however, the ovarian cell becomes more transparent and its granules more distinct. With ether the granules of Drysdale's cell become nearly transparent, though the general appearance of the cell remains unchanged. Unfortunately, however, the claims of Drysdale respecting these cells have not been verified, since they merely represent swollen and degenerate epithelia, such as appear in the fluid of other cysts under similar circumstances; or, as Garrigues suggests, they are the nuclei of epithelial cells in a state of fatty degeneration. While their presence is thus devoid of any positive diagnostic significance, the absence of the "ovarian cells" has some negative value in showing that the cyst is probably not of ovarian origin. What is thus true of the "granular ovarian cell" may also be said of all the various other ingredients which enter into the composition of ovarian fluids: experience has shown that none are sufficiently characteristic to enable a positive diagnosis to be based either upon their presence or

[1] T. M. Drysdale: "On the Granular Cell found in Ovarian Fluid," *Trans. of the Amer. Med. Assoc.*, vol. xxiv. p. 179.

absence. Says one of the latest and best authorities[1] in this connection: "Much has been written on the possibility of diagnosing ovarian fluid through its chemical composition and microscopical constituents: even the spectroscope has been called in to aid us. Chemistry has certainly failed, and so has the spectroscope; and the presence of certain peculiar cells, which were for some time considered pathognomonic, has now been proved almost valueless for diagnostic purposes. The vacuolated cells of Thornton and Foulis are now known not to be characteristic of malignant disease, as was at one time thought certain; and we are now practically left without any single reliable physical test of the contents of an ovarian cyst. We can say that a fluid is ovarian with a greater probability of truth than we can say that it is not; and in most cases the grounds of this statement might rest as securely on the simple visual appearance of the fluid as on its composition or the nature of the cells contained in it. But the value of all such tests is best estimated by the weight which practical men put upon it; and that is almost *nil*. We never hear of the removal of ovarian fluid for examination; the diagnosis is made by other means." Though not in accord with the opinions entertained by some competent investigators,[2] it is doubtless true that these views of Smith receive the assent of the great majority of those whom practical experience has qualified to pass judgment in the matter.

THE PEDICLE OF THE OVARIAN CYSTOMA.—Were we to assume that the ovary, in its efforts to invade the abdominal cavity, passed from its original retro-peritoneal site forward and upward between the two layers of serous membrane forming the broad ligament, and when nearly through the posterior of these lamellæ had been arrested in its progress, then the peculiar position of the organ with reference to the peritoneum would be made clear. The major part of the gland, with its covering of germ-epithelium, thus projects into the cavity of the peritoneum—that is, it is intra-peritoneal (Pl. IV. Fig. 1)—while the base or hilum is encircled by that portion of the posterior peritoneal layer of the broad ligament forming the mesovarium; in other words, it is intra-ligamentous or extra-peritoneal. Should a tumor arise in the more superficially disposed structures of the parenchymatous zone, it would naturally tend to invade the abdominal cavity in its growth, maintaining the intra-peritoneal position of its starting-point, in the free portion of the ovary (see Pl. IV. Figs. 2 and 3); while, on the other hand, a tumor arising from the medullary strands of the ova-

[1] *Vide* J. Greig Smith: *Abdominal Surgery*, London, 1887, p. 86.

[2] Garrigues (*op. cit.*) claims that, even where the patient is unknown, the diagnostication of an ovarian cyst is almost always possible by studying the physical, chemical, and microscopical characters of its contents, while in conjunction with the other features of a case the probability of success is necessarily enhanced.

rian hilum, and developing in the direction offering the least resistance, would just as naturally preserve a subserous position, displacing successively the loose, intra-ligamentous connective tissue and that filling in the deeper subperitoneal spaces of the pelvis.[1] (See Pl. IV. Figs. 1, 7, and 8.)

Occasionally, however, the disease begins at such a point that the mechanical obstacles to its progress are about evenly divided, and the resulting tumor is partly intra-, partly extra-peritoneal, the distal orifice of the mesovarium encircling the constricted intermediate portion of the growth. In each of the latter two cases of subserous development there would be, of course, no pedicle; though the term "false pedicle" has been applied by Doran to the various pelvic tissues whose excision is necessary in order to effect the removal of such growths. In the case of a small intra-peritoneal tumor arising in the free portion of the ovary, however, its attachment to the uterus or its true pedicle would be the same as that of the ovary itself; though, as the neoplasm developed in size, its growth, coupled with the effects of traction and the changes due to hyperplasia, might result in any of those manifold variations in the pedicle whose occurrence invests each new case with fresh interest in the eyes of the ovariotomist. But before discussing at greater length the formation of the pedicle, a structure of such vast surgical importance, let us revert for a moment to the normal structures concerned in the process.

[1] Freund (*Berl. klin. Wochenschr.*, 1878, No. 28) explains the intra-ligamentous growth of ovarian tumors by assuming that, in consequence of developmental errors, the organ is congenitally displaced, its base being imbedded more deeply than is normal between the folds of the broad ligament. (See also Schmidt: *Dissert. inaug.*, Strassburg, 1879.)

Explanation of Plate IV.

The figures of the plate illustrate the typical cysts of the ovary and Wolffian remains, showing their genesis, development, topographical relations, and heterogeneous epithelial covering, as well as the construction of the pedicle. Of these, Figs. 1, 2, 3, 4, 5, 7, and 8 represent antero-posterior sections, cut so as to form an angle of about forty-five degrees with the median plane of the body (vide *s s* and *m m* in Fig. 6). In Fig. 6, however, a horizontal section is shown, while Figs 9 and 10 are front views.

The peritoneum is represented by the blue line, the epithelial covering of the ovary by the interrupted red line (Coblenz): *k*, cyst; *ov*, ovary; *p*, peritoneum; *t*, tube; *lr*, round ligament; *bg*, blood-vessels; *u*, uterus; *vg*, vagina; *ota*, abdominal orifice of tube; *av*, broad ligament.

Fig. 1.—Transverse section through the tube, ovary, and round ligament of a newborn child (natural size), showing the peritoneal folds of the broad ligament, interrupted by the ovarian covering of cylindrical epithelium.

Fig. 2.—Multilocular glandular cystoma of the ovarian cortex (region of Pflüger's tubes).

Fig. 3.—Unilocular glandular cyst, having the same origin.

Fig. 4.—Papillomatous cyst of the hilum (zone of Kölliker's medullary strands).

Fig. 5.—Cyst of the parovarium.

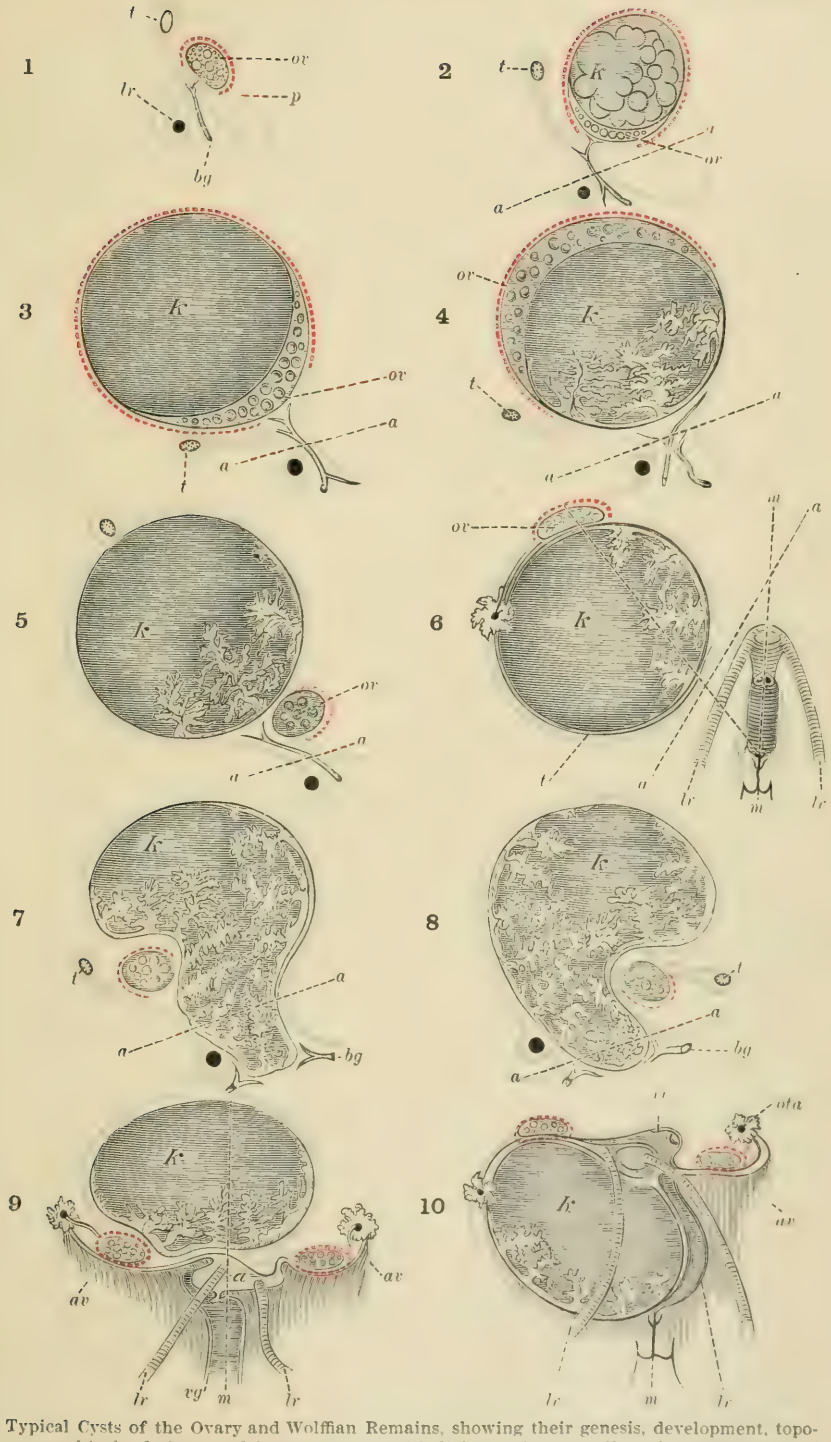
Fig. 6.—Same as Fig. 5, though representing a horizontal section through the tube, ovary, and tumor.

Fig. 7.—Intra-ligamentous cyst of Wolffian origin, expanding at the expense of the posterior peritoneal fold.

Fig. 8.—Rarer form of intra-ligamentous cyst, the growth of which causes the protrusion of the anterior layer of the broad ligament.

Fig. 9.—Cyst of the upper or para-uterine portion of Gartner's duct.

Fig. 10.—Cyst of the lower or para-vaginal portion of Gartner's duct.



Typical Cysts of the Ovary and Wolffian Remains, showing their genesis, development, topographical relations, and heterogeneous epithelial covering, as well as the construction of the pedicle (Coblenz).

Along the upper margin of, and between, the two layers of serous membrane constituting the broad ligament runs the Fallopian tube, which terminates in a fimbriated abdominal orifice, *morsus diaboli*, leaving a portion of the broad ligament, termed the infundibulo-pelvic ligament, intervening between the infundibulum and the lateral wall of the pelvis. Upon the posterior surface of the ligamentum latum, and formed by a special extension of the corresponding serous lamella, occurs a second fold, running in a nearly straight line from the upper angle of the uterus to the morsus diaboli and divided into three portions. Of these, the middle, or mesovarium, sustains the ovary; while the inner and outer thirds include the ovarian and tubo-ovarian ligaments respectively, the latter being reinforced by the ovarian fimbria of the tube. The triangular portion of the broad ligament comprised between the tube and this special ovarian fold is called the *ala vespertilionis*, or bat's wing.

The first of these structures to enter into the formation of the pedicle of an intra-peritoneal ovarian tumor is, necessarily, the mesovarium; though the traction exerted by the growth soon involves the ovarian and tubo-ovarian ligaments, and with the latter, through the agency of the ovarian fimbria, the fimbriated extremity of the tube. As the layers of the infundibulo-pelvic ligament and ala vespertilionis are gradually separated by the force of the growing tumor, the infundibulum, and with it more or less of the ampullar extremity of the oviduct, comes to lie in immediate contact with the growth, though the latter is generally separated from most of the proximal portion of the tube by the greatly elongated and narrowed mesosalpinx. Occasionally, however, even this remnant of the ala vespertilionis is quite effaced; and the thickened, injected, and lengthened tube rests directly upon the surface of the cystoma.[1] Thus in cysts large enough to require removal the pedicle is almost invariably formed of the ovarian ligaments, part of the broad ligament, and the Fallopian tube, though in exceptional cases the last-named structure is not included.[2] All are usually in a condition of more or less marked hyperplasia, though at times atrophy of one or more of the pedunculer constituents is observed instead. In rare instances it happens that the atrophic changes in that portion of the broad ligament included in the pedicle are so marked that it divides into two parts, one of which contains the ovarian ligament, the other the tube; or one branch of the double pedicle may be formed of the tube and ovarian ligament, the other of

[1] For a detailed description of the anatomical peculiarities of the various forms of pedicles the reader is referred to Werth's interesting monograph, *Arch. f. Gyn.*, Bd. xv. S. 412.

[2] Though some writers, in enumerating the structures which enter into the formation of the pedicle, include the round ligament, this is hardly proper, since it is never attached to the cyst, and is rarely, if ever, included within a ligature.

the infundibulo-pelvic ligament (Werth, Nussbaum, and Spencer Wells). Should ovarian cysts, however, develop in both ovaries, invade the abdominal cavity, and subsequently undergo fusion, the resulting mass would be attached to the pelvic organs by two true pedicles, each composed of the broad and ovarian ligaments, together with the tube. Doran's experience embraces five such cases. An analogous condition has been observed by Olshausen in two cases, where, though but one ovary was diseased, the tumor possessed two pedicles, each comprising the uterine appendages of the corresponding side. The pedunculer attachment to the sound side, however, was of a decidedly anomalous character, the tube and part of the broad ligament having adhered to the surface or become imbedded in a furrow of the tumor. In its dimensions, as well as in the size and number of its vascular constituents, the pedicle exhibits every possible variation. Thus it may form a round, slender stalk four and even six inches long, though more commonly its length ranges from one to two inches. In like manner the breadth of the pedicle varies from a few centimeters to the full length of the broad ligament; and it may form a thick, fleshy mass or a comparatively membranous extension. As a rule, however, pedicles are of moderate length and breadth; when very broad they are usually quite short.

The vessels of the pedicle are derived from the ovarian arteries—the homologues of the spermatic in the male—and from the uterine arteries. The former, which constitute the principal and most direct supply, enter laterally through the infundibulo-pelvic ligament; while the uterine arteries, with their corresponding veins, pass into the pedicle from the uterine side. Occasionally the central portion of the pedicle contains masses of dilated veins derived from the pampiniform plexus and resembling those which characterize varicocele. Long and thin pedicles usually contain fewer vessels than do pedicles which are short and thick, though in the former case they are generally larger than in the latter. While in exceptional cases the veins of a pedicle may rival the little finger in size (T. S. Lee), the diameter of the arteries rarely exceeds that of the radial; and, inasmuch as the blood-pressure is comparatively slight, hemorrhage from the proximal end of a divided pedicle is easily controlled. Lymphatics, nerves, smooth muscle-fibres, and fibrillated connective tissue also enter into the construction of the pedicle.

As we have already seen, small tumors, and especially those of a solid nature, may not possess a true pedicle. The ovary at the point of its attachment to the broad ligament simply widens in a degree corresponding to the size of the tumor, and thus the sessile growth is held in position merely by the mesovarium. Again, the pedicle is absent when the tumor pushes its way between the folds of the broad liga-

ment. In such an event the direction pursued by the cystoma in its development may be most pronounced in either an inward, outward, backward, or forward direction. It may but partially separate the serous layers of the broad ligament, leaving the inferior portion intact; or, passing entirely through, it may invade the pelvic connective tissue and pursue its way in any direction through this yielding subserous material. Thus the base of the tumor may come in contact with the side of the uterus or with the lateral pelvic parietes; it may cause a marked protrusion of the posterior, or more rarely of the anterior, lamella of the broad ligament. (See Pl. IV. Figs. 7 and 8.) Following any of the intra-pelvic planes of connective tissue, the growth may press on to the perineum itself; or, pursuing an upward course, may insinuate itself into the subperitoneal connective tissue, stripping the serous membrane from the anterior or posterior abdominal wall, and in the latter situation perhaps forcing asunder the folds of mesentery, mesocæcum, or mesocolon, thus coming into immediate contact with the intestines themselves.

In the case of the papillary cystomata chiefly, which oftenest develop thus extra-peritoneally, the papillomatous masses, perforating the cyst-wall, may penetrate the bladder, uterus, rectum, or other viscera, the tumor becoming thus incorporated with these structures into one solid mass. The displacement and distortion of the various pelvic and abdominal viscera thus produced by these non-pedunculate, extra-peritoneal cysts can be much more readily imagined than described. Either the whole or only a part of a cystic tumor of the ovary may thus develop beneath the peritoneum; and Olshausen calls attention to the fact that a portion of a tumor previously extra-peritoneal may, by the atrophy and destruction of its serous covering, be laid bare, and thus assume a free intra-abdominal position. Though principally intended to elucidate the growth and topography of cysts developing from the parovarium and other remains of the Wolffian bodies and ducts, Plate IV. may be referred to with profit in connection with the subjects discussed in the present section.

Accidental Changes in the Cystomata.—Among the more important secondary changes of an accidental nature which may affect the ovarian cystomata are—hemorrhage, suppuration and gangrene, torsion of the pedicle, and rupture.

1. Hemorrhage.—The effusion of blood into the walls or cavities of ovarian cysts is by no means an uncommon accident, and may result from the operation of any of a number of causes; though at rare intervals a profuse intra-cystic hemorrhage may ensue without any assignable reason. Thus in tapping a cyst a large vessel in its wall may be opened, or this removal of the intra-cystic pressure by puncture or aspiration may be followed by the escape of blood from ruptured

capillaries. Other forms of traumatic influences may bring about the same condition of things, while even the stretching which the cyst-wall undergoes during the growth of the tumor may suffice to rupture a vein. Spontaneous hemorrhage is also prone to take place from the vascular papillomatous structures which spring from the lining membrane of some cysts, the likelihood of such an event increasing with the exuberance of the new papillary growths. Of all the causes resulting in marked spontaneous hemorrhage, however, the most frequent is torsion of the pedicle. Though generally slow, slight in amount, and hence more or less latent, the flow of blood is in some instances so profuse as to endanger the life of a patient. In the latter case the dimensions of the cyst may suddenly be increased, when great pain is experienced because of the distension, and symptoms due to the loss of blood supervene. Two cases of this kind have occurred in the practice of Dr. Thomas,[1] while Parry[2] records an instance of dangerous collapse occasioned by sudden intra-cystic bleeding, which was so profuse that within a few hours the diameter of the cyst was increased from one to one and a half inches in every direction. In a fatal case reported by Patruban[3] ruptured vessels were found, this condition having been produced apparently by torsion of the pedicle.

2. Suppuration and Gangrene.—Inflammation attended with suppuration or gangrene rarely attacks the walls of ovarian cysts, save as a result of pedunculer torsion; and in any event the *raison d'être* of these exceptional cases may almost invariably be traced to surgical interference, vegetable organisms of a septic character having gained entrance during the operation of tapping, for example, either through the use of unclean instruments or from failure in some other respect to exercise the strictest antiseptic precautions. Occasionally, however, suppurative or gangrenous inflammation of a cryptogenetic character affects simple cysts as well as proliferating cystomata: the cause is obscure, and, to all appearances at least, the disease is quite spontaneous. But in all probability these cases too are of fungous origin; and, when we consider the prevalence in them of adhesions between intestine and cyst-wall, the explanation of Olshausen, to the effect that the suppuration is the result of a direct bacterial migration from the former, seems very plausible. This view is apparently disproved by the unique experience of Weil,[4] who met with a case of intra-cystic suppuration in which tapping had not been resorted to and where no intestinal adhesions existed. In attempting an explanation, this

[1] *Diseases of Women*, 5th ed., p. 695.

[2] *Amer. Journ. of Obstet.*, Nov., 1871. A similar case is reported by Rosenberger, *Berl. klin. Woch.*, 1880, S. 270.

[3] Quoted by L. Gallez: *Histoire des Kystes de l'Ovaire*, Bruxelles, 1873, p. 150.

[4] *Prag. med. Wochenschr.*, 1878, No. 43.

observer assumed that septic organisms found their way into the cyst from the blood; but it must be borne in mind that any previous adhesions which may have been present might easily have been loosened during the operation without exciting notice. The great pressure to which pelvic tumors are subjected during parturition may also give rise to suppurative inflammation.

3. Torsion of the Pedicle.—If, from any cause, a rotary motion is imparted to an ovarian tumor, its pedicle becomes twisted, and symptoms of a subjective and objective nature supervene, the importance of which is proportional to the amount of compression which the torsion exerts upon the vessels of the part. Naturally, one would expect this accident to occur oftenest in the case of firm, small tumors, or those of medium size, whose peduncular attachments were long and slender; and, as a matter of fact, this is true, though it is possible for axial rotation to take place in any of the pelvic tumors, provided they be free to move and have pedicles which admit of twisting. It would certainly be difficult, however, even to imagine the rotation of a proliferating cystoma so large as to fill completely the pelvic and abdominal cavities—such a growth as stamps its victim with that peculiar physiognomy, the *facies ovariana*, so graphically described by Wells. And, even after being reduced in size by puncture, the flaccid, yielding wall of such a large cyst, by conforming to its uneven environment and merely giving way locally before any force brought to bear upon it, would prevent the rotation of the tumor by those various agencies to which this accident has been attributed. In like manner, a tumor having a very short or a broad and thick pedicle would be proportionally less liable to turn upon its axis. The special frequency with which dermoid cysts are affected in this manner, and the comparative rarity of the accident in the case of solid ovarian tumors, serve to corroborate these statements. In the former instance we have firm tumors of moderate size, and provided generally with small pedicles; while, on the other hand, the peduncular attachments of solid ovarian growths, being usually short and thick, are well calculated to resist the action of those forces which result in torsion. The attention of the profession appears to have been first directed to this incident in the life-history of ovarian tumors, which is so important from both a pathological and clinical point of view, by Rokitansky. According to this author, torsion of the pedicle occurs in about 12 per cent. of all cases of ovarian tumors, and in about 6 per cent. is the cause of death, though widely different results are given by other observers.[1] Thus, Tait met with but 1 case in his first 100 ovariotomies; while Wells observed the condition at

[1] *Vide* Rokitansky: "Ueber der Strangulation von Ovarialtumoren durch Achsendrehung," *Zeitsch. d. K. K. Gesellsch. d. Aerzte in Wien*, 1865; also, the *Lehrb. d. path. Anat.*, by the same author.

least 12 times in 500 operations of this character; Thornton, 34 times in 400; Schroeder, 27 times in 194; M. Terrillon,[1] 4 times (complete) in 100; and Olshausen, 21 times in 322 ovariotomies. Of these writers, the last named estimates that torsion probably occurs in about 8 per cent. of all cases. The degree of torsion ranges usually from one half to two revolutions, though as many as five and six complete turns of the tumor have been reported by different observers. Since the ovarian ligaments and more or less of the broad ligament are always included in the pedicle, these structures are invariably affected; while the tube, which is usually though not necessarily involved, describes in the former case a spiral around the outside of the pedicle, or, if adherent to the tumor, around both tumor and pedicle. When not included in the pedicle, the tube of course remains unaffected by the axial rotation of the tumor; and, as for the round ligament, this is very rarely involved.

In rotating, a tumor of either ovary may turn to the right or left; that is, a point on its upper or anterior surface may move in these directions,[2] or, in other words, the growth may twist in the direction taken by an advancing or receding screw respectively. Moreover, the tumor may turn upon a lateral axis, either backward or forward. As a rule, rotation takes place gradually, though at times it is apparently rapid in its occurrence. Again, the twist may not be permanent; but the neoplasm may subsequently turn back to its original position, or even beyond it. Should this recur, the motion would have an oscillating character, its various phases being evidenced perhaps by both subjective and objective signs.

The *causes* to which this accident is to be ascribed are not clearly known, though many theories have been advanced. Thus, some attribute the torsion to the peristaltic movements of the intestines; Klob, to the alternate filling and emptying of the bladder; while Thornton,[3] who believes the former cause to be especially potent in the case of cysts rendered flaccid by tapping, asserts that the pulsations in the twisted pedicle would tend to increase the condition when once thus started. Others (Fritsch, Olshausen) deem irregular growth of the tumor a potent factor. One sac outstrips the others in its development, or heavier solid tissue predominates in a secondary cyst, whereby the centre of gravity is displaced and partial rotation of the growth ensues, which may later be rendered complete by changes in the posi-

[1] Quoted in the *Medical Press of Western New York*, Dec., 1887.

[2] In speaking of the rotation of an ovarian tumor, the direction first taken with reference to the body of the patient by that portion of its wall which corresponds to the upper surface of the ovary itself is considered.

[3] Consult Thornton's article on the "Rotation of Ovarian Tumors," *Med. Times and Gaz.*, vol. ii. p. 82.

tion of the patient. It is possible, too, that a rotary motion may be imparted to a growing tumor in its passage from the pelvis to the abdominal cavity, because of the peculiar conformation of the former. The development of a second tumor, as the uterus in pregnancy, may cause the rotation of an adjacent ovarian growth; while the same effect is at times produced by the evacuation of the uterus in parturition or by tapping. The presence of ascitic fluid would, of course, favor the occurrence of this accident, just as the presence of adhesions would tend to prevent it. According to Tait's theory, which is based upon a rather limited personal experience, the passage of fecal matter through the rectum is the prime factor to which twisting of the pedicle must be attributed.[1] In all of this observer's cases the tumor had developed from the right ovary, and, with one possible exception, the direction of the twist was from left to right. Tait therefore assumes that the growth from the right ovary is provided with a free pedicle and lies obliquely in the abdominal cavity, the upper extremity of its long axis being directed toward the "top of the ninth or tenth rib on the left side." Now the conditions would be most favorable, and, especially when the patient was lying down, all hard fecal matter, in passing behind or beneath the tumor, would act as a wedge and effect its gradual rotation. With this view Doran[2] concurs, though disposed to grant priority to the simpler doctrine, that the tumor, held at both ends but comparatively free in front and at the sides, revolves on its axis in the various positions assumed by its host. Unfortunately for Tait's premises, however, Olshausen states that in 15 out of his last 19 cases of torsion the tumor had developed from the *left* ovary. Where each ovary is replaced by a tumor, double torsion may occur, Thornton, Röhrig, and others having reported such cases.

The *consequences* entailed upon both tumor and patient by torsion of the pedicle are manifold, varying with the rapidity of its occurrence as well as with its degree. Should the circulation through the pedicle be suddenly and completely arrested, the tumor is entirely deprived of nourishment, and, as a necessary result, perishes almost instantly. Decomposition rapidly supervenes in the mass of dead tissue, an acute diffuse peritonitis is lighted up, and, unless operative interference be promptly resorted to, death quickly puts an end to the patient's misery. Thousands have thus perished in times past from the gangrene of ovarian tumors resulting from torsion of the pedicle; but it is refreshing to know that since the condition has been recognized, and the necessity of immediate operation appreciated, the number of victims has been somewhat reduced.[3] Fortunately, however, such extreme

[1] *Diseases of the Ovaries*, Amer. ed., p. 302 *et seq.* [2] *Op. cit.*, p. 119.

[3] Accounts of such operations, some successful and others not so, are given by Wells, Thornton, Tait, Wiltshire, and many others.

cases occur only exceptionally: as a rule, the interference with the circulation in the pedicle is more gradual and less marked. Thus, while the lymphatics and thin-walled veins quickly yield to the compression exerted by the torsion, the thick walls and greater tension of the arteries enable them to offer a more effectual resistance; and, consequently, the arteries continue to force into the tumor more blood than the veins are capable of removing. The mechanical or venous hyperæmia thus produced results in the transudation of serum, the diapedesis of red blood-corpuscles, and perhaps in hemorrhage. In the latter case the engorged veins and capillaries give way under the heavy strain, and blood is effused into the cysts, the walls of the tumor, or its pedicle. The severity of the hemorrhage varies, being at times so slight as to cause few symptoms; while, again, the amount of blood lost is so great as to occasion marked anæmia, or even death itself. Numerous instances of severe intra-cystic hemorrhage have been reported by various observers, while Wells and Patruban[1] mention cases having a fatal termination. The œdema, hyperæmia, and effusion of blood, resulting from this partial strangulation of the pedicle, produce a rapid and characteristic enlargement of the tumor that may either precede or accompany the sudden and severe abdominal pain and tenderness, which, with vomiting, are especially symptomatic of torsion. In these cases the main cyst-wall presents a changed appearance. Instead of the glistening, wellnigh silvery, surface which marks the ordinary growth, more or less discoloration is observed, the tumor assuming any shade ranging from gray nearly to black. It is not merely to the intra-cystic blood, however, or to that extravasated within the walls of the tumor, that this is to be attributed, but rather to the process of imbibition, whereby the coloring matter of the underlying blood is absorbed.

But even though the strangulation of the tumor be not expedited by the continuation of its axial rotation, the changes which ensue in the pedicle tend to produce this result, though more slowly. Œdema and extravasation, coupled with the twisting which it has undergone, cause the enlargement of the pedicle; its veins become filled with clotted blood or thrombi; its arteries are obstructed by the increased pressure to which they are subjected; the pedicle itself suffers from want of nourishment, undergoes fatty degeneration, grows soft and friable, and finally gives way entirely, perhaps leaving the tumor devoid of any peduncular attachment to the uterus. Gangrene, however, rarely supervenes in these cases; for, while the food-supply through the pedicle is being gradually cut off, the tumor forms other alliances through which its needs are vicariously supplied. The nutritive disturbances excited in the growth by this interference with the circulation through its ped-

[1] *Oester. Zeitschr. f. pract. Heilkunde*, 1855. *Vide* article by Hunter, *Medical Record*, April 18, 1885.

icle result in a conservative peritonitis; adhesions of greater or less extent form between the tumor and the surrounding serous surfaces; the new vessels contained in these bands of recent connective tissue enlarge, to meet the increasing demands made upon them because of the gradual stoppage of the peduncular supply; and, finally, though entirely deprived of its original support, the growth of the tumor goes on, perhaps more rapidly than before, though occasionally retrogressive changes ensue. The adhesions, by which the "transplanted" tumor is enabled to maintain its parasitic existence, connect it with the abdominal wall, omentum, intestines, mesentery, or other organs. Interesting cases of this kind have been reported by Wells, Tait, Doran, Baumgarten, Hofmeier,[1] Peaslee,[2] and others. By reason of the movements of the tumor or of the organs to which it may be attached, the adhesions may be drawn out into vascular shreds or cords, which impart the shaggy appearance shown in the accompanying illustration (Fig. 339). The most desirable result which can follow rotation, however, is the involution and atrophy of a tumor, to which attention was first directed by Rokitansky. This takes place in cases where the supply of blood is diminished by the torsion to such an extent that it no longer suffices for the complete sustenance of the tumor, though still large enough to prevent the occurrence of gangrene.[3] The secondary changes in such cystomata are chiefly fatty degeneration and calcification, the tumors diminishing in size with varying rapidity, and their remains finally appearing as hard masses, within which more or less fatty detritus of a brownish color is usually found. Should adhesions subsequently form, such retracted tumors may again increase in size. Olshausen, Flaischlen, Hofmeier, Veit, and Breisky mention cases in which this marked diminution in the size of the tumor occurred. In one instance the patient experienced excruciating pain for some hours; when, after first increasing in size, the tumor, which reached to a point midway between the umbilicus

FIG. 339.

A Cyst which had been Separated from its Pedicle by Torsion, and received its nourishment through adhesions (Doran).

[1] *Zeitschr. f. Geb. und Gyn.*, Bd. v. S. 1.

[2] *Amer. Journ. of Obstet.*, 1878.

[3] Atrophic changes in an ovarian tumor have also been caused by inflammatory adhesions; the pedicle, which was free from twists, being sufficiently compressed by the contraction of the new tissue.

and ensiform cartilage, gradually grew smaller, till, after the lapse of some seven years, its dimensions did not exceed those of a hen's egg.[1] The observance of these isolated cases of spontaneous recovery naturally led to the idea that this most desirable consummation might be effected by proper manipulation, and the artificial production of torsion has been gravely suggested as a therapeutic measure. When one considers, however, the difficulties involved in the estimation and production of the proper degree of rotation, and the risks incurred from failure, it becomes evident that so desperate an expedient will seldom be resorted to. The symptoms following the accidental twisting of the pedicle have certainly not been reassuring in this respect. Thus, while examining a patient under an anæsthetic, Olshausen produced torsion of an ovarian tumor, the accident being followed by an acute circumscribed peritonitis which quickly resulted in fixation. Schroeder also mentions a case in which he was enabled to turn the tumor for a certain distance in either direction, though the supervention of violent pains soon necessitated its restoration to a normal position.

Another grave, though fortunately rare, consequence of torsion is obstruction of the intestines; the bowel sharing in the rotary motion of the tumor because of adhesions between the two, or becoming entangled in the turns of a long pedicle. In a case described by Guenther the result was the same, though effected in a peculiar manner. The twisting of the pedicle naturally caused a shortening, in consequence of which the tumor was drawn into the inlet of the true pelvis, thus forcing the rectum against the pelvic brim and causing its complete occlusion.

4. Rupture of Ovarian Cysts.—That this accident, the potential importance of which is so great, complicates the life-history of ovarian tumors far more frequently than one would suspect on first thought, is abundantly demonstrated by the experience of many leading operators. Thus, Wells declares that in 300 of his more recent ovariotomies this condition presented itself 24 times; while Thornton met with free fluid in the abdominal cavity, as the result of rupture, 40 times in performing 400 operations of the same nature. Still more frequently, perhaps, than actual perforations are found the cicatricial areas which mark the sites of former ruptures.

The *causes* which lead to rupture are various, and comprise those of a predisposing, as well as of an immediate or exciting, character. In the first place, the thinning of the cyst-wall from pure distension occupies a prominent place in the former list. If the main wall of the proliferating cystomata especially be examined, it will be found to vary markedly in thickness; some portions being firm and strong, while others are so thin as to be nearly or quite transparent. Further

[1] *Vide* Breisky: *Wien. med. Presse*, Bd. xxiii. S. 601.

observation will disclose the fact that these transparent areas correspond in position with secondary cysts which press against the main wall; and it becomes apparent how a degree of tenuity is sooner or later reached which is poorly adapted to resist even the bursting force exerted by the cyst-contents, to say nothing of external violence. Where distension occurs more slowly, however, the cyst-wall undergoes retrograde changes due to chronic localized anæmia. It becomes fatty and atrophied; or, again, irregular patches of a dull yellow or brown color, such as are described by Wells, appear on the inner surface of the cyst-wall, representing degenerated tissue, the result, in all probability, of inflammatory changes. Should one of these atrophied or degenerate patches rupture, the edges of the opening may assume a reddish, thickened appearance, conveying the impression that the accident was due primarily to ulceration of the cyst-wall. As a rule, however, the reverse is the case. When the rent first takes place in such tissue, its margins are naturally thin, and it is merely to a secondary inflammation, evoked by the irritating discharge, that the appearances to which we have just adverted are to be ascribed. When small secondary cysts develop in the main wall of the tumor and rupture internally, discharging their contents into the cavity of the principal cyst, their remains are represented by circular or oval patches, covered with the original cubical or cylindrical epithelial lining of the small cysts, and surrounded by their collapsed walls. (See Fig. 328.) Such circular or oval depressions with their raised borders are also frequently referred to as "ulcerations." These patches become converted later into a sort of cicatricial tissue, which is apt to degenerate and give way; in fact, this process, whereby the effacement of secondary cysts is accomplished, constitutes one of the most frequent among the predisposing causes of rupture. The formation of thrombi in the vessels of the cyst-wall, resulting perhaps in fatty degeneration, softening, and gangrene; the various nutritive changes consequent to torsion of the pedicle which we have just considered, as well as the hemorrhages, both intra-cystic and interstitial, from the same cause; severe suppurative inflammation of the main wall; the growth of papillomata,—all these certainly favor the occurrence of rupture, though not necessarily resulting in this accident.

The immediate causes may be grouped under the one head of *pressure*, applied suddenly or more slowly, and varying markedly in degree. Thus, the jar attending a slight misstep, or even a change of position, such as turning in bed, may be sufficient to cause a weakened cyst to give way. Coughing has resulted in rupture (Doran), as well as falling on the ice (Simpson) or down stairs (Schroeder). Direct blows upon the abdomen, the manipulations attending physical exploration, the muscular force exerted in parturition, the pressure of forceps, forci-

ble contact with the brim of the pelvis, or any other condition resulting in the application of pressure to such a tumor, may precipitate its rupture. The presence of papillomatous growths within a cyst greatly increases its liability to rupture, as we have already seen in a previous section. The luxuriant development of the papillary masses results in pressure upon the walls of the sac after its interior is completely occupied, and perforation is the final outcome of the gradual erosion thus excited. Less frequently the proliferating cauliflower-like structures seem to invade the wall of the cyst directly; though in either case, after escaping from the confines of the sac, the papillomatous excrescences manifest their well-known tendency to spread over the outer surface of the tumor and that of the adjacent organs, even penetrating these in their growth. In form, the rupture may appear as a rent or tear or as a round or irregular opening, the dimensions varying greatly in either instance; while an aperture, originally small, may be widened by the wedge-like entrance of papillomatous growths or small secondary cysts.

The *results* of rupture vary with the amount and quality of the cyst-contents, the rapidity and direction of the discharge, as well as with the degree of bleeding which may be excited by the lesion itself. According to Nepveau and Aronson, the mortality in consequence of this accident amounts to about 40 per cent.; though this figure is evidently based upon incomplete data, and refers merely to cases whose symptoms were sufficiently characteristic to serve as diagnostics. When we consider that in the majority of cases the indications of rupture are so slight as to be quite overlooked, it becomes evident that the above estimate is too great, and that the real percentage of deaths is comparatively small. When an ovarian cyst ruptures, its contents escape into the abdominal cavity in by far the larger number of cases; and the effects produced by such a foreign invasion vary in accordance with the conditions already enumerated. Should a bland, unirritating fluid thus gain access to the peritoneal cavity, little or no reaction might ensue, even though the effusion was considerable in amount. Nature would rid herself of the intruding fluid by the process of absorption; and, if it were abundant, the success of her efforts would be attested by an increased flow of urine, and perhaps of perspiration. In illustration of this might be cited a case reported by Lambert,[1] in which rupture was followed by anasarca and profuse diuresis, sixty-five pints of urine being discharged in the course of four days. The escape of colloid material is likewise attended with little disturbance when free from pus, blood, septic organisms, or other substances of an irritating nature; although its absorption is effected more slowly than in the case of fluids. The presence of these noxious elements, however, is always

[1] *The Lancet*, May 29, 1879.

productive of mischief more or less marked; the cyst-contents are no longer of an indifferent character, but irritating; an inflammation is excited which may prove fatal; or, finally, a lethal result may follow from the immediate shock of the accident or from septicæmia, rather than by reason of the peritonitis. These are the cases in which the amount of the exudation becomes a matter of such serious import; for, while it is true that the contents of a very small sac may suffice to light up a fatal peritonitis, the effects of such an irritant are usually somewhat proportional to its quantity.

The *rapidity* with which the contents of a ruptured cyst escape is also a matter of importance, a gradual effusion being most favorable as well as most common. Where the cyst-wall is perforated by papillomatous growths the leakage is generally slow; inasmuch as the papillary masses, by crowding into the aperture, tend to fill up the very rent which they produce. The same result may be accomplished by a secondary cyst, which presses against, or even invades, the opening in the ruptured sac. Symptoms of shock usually supervene early when the abdominal cavity is flooded through a large opening in a cyst of considerable size. As a rule, the hemorrhage attending the rupture of a cyst is slight, owing to the diminished vascularity of that portion of the wall which yields. Should the cyst-wall be well supplied with blood-vessels, however, or should its interior contain vascular growths, the tear, coupled with the removal of that support afforded by the contents, previous to their escape, might result in a very serious, or even fatal, loss of blood. We have already alluded to the fact that the rupture of an ovarian cyst containing papillomatous masses is very apt to be followed by the general infection of the peritoneum, secondary growths springing up in all directions, and often deporting themselves in a manner altogether suggestive of great malignancy. In like manner, though much more rarely, the escape of the colloid contents of a ruptured glandular cystoma may be followed by the appearance of tough and somewhat vascular gelatinous masses, of a gray or yellow color, on the surface of the peritoneum. These secondary growths assume the form of jelly-like nodules, ranging from a minute size to that of a hickory-nut; or they may become confluent, covering the abdominal viscera with a continuous layer of the same material. Because of their appearance, and the fact that they often contain mucin, such formations are usually spoken of as *myxoma peritonei*—a term which Werth, who regards them as distinct from the myxomata, replaces with *pseudo-myxoma peritonei*. Should a cyst have undergone carcinomatous or sarcomatous change, its rupture would probably be followed by the appearance of metastatic growths of like character in the abdominal, thoracic, or cranial cavities.

It is in these very cases, however, that Nature's conservatism is most

beautifully displayed. She strives—though often in a blundering and futile manner, 'tis true—to avert the evil consequences of rupture into the peritoneal cavity; and, fortunately, her efforts are furthered by the fact that those conditions which result in the escape of inflammatory, septic, or malignant elements from the cyst are almost invariably caused by, or attended with, inflammation of its walls.

It is in consequence of this inflammation, or of direct irritation, that a plastic peritonitis, Nature's chief prophylactic agent, is excited, which results in the formation of more or less extensive adhesions between the tumor and the adjacent serous surfaces. Should perforation of the diseased cyst-wall now ensue, its contents would not escape directly into the peritoneal cavity, but, meeting with the layer of new connective tissue comprising the adhesions, they might pass both through it and the adjacent structures. In this manner the cyst may rupture into the intestines, stomach, vagina, Fallopian tube, or bladder, as well as externally through the abdominal walls; and it is almost needless to say that in any of these events the patient's chances of spontaneous recovery are greatly enhanced. That the cure of multilocular cystomata does not result from rupture can be easily understood. It is only in the case of monocystic growths that such a mode of recovery becomes possible, and even then it forms the exception rather than the rule.

Cysts of the Broad Ligament.

Parovarian Cyst.—Between the folds of the peritoneal reduplication which constitutes the broad ligament are found, as we have already seen, the tube, part of the ovary, the ovarian and round ligaments, blood-vessels, nerves, lymphatics, and smooth muscular fibres—all supported by that loose areolar connective tissue which prevails throughout the pelvis as its stroma, so to speak, and which plays such an important rôle in some of the inflammations of the latter region. But besides these, and of far greater interest to us in this connection, are the remains of the embryonic mesonephros (Lankester) or Wolffian body, and of its excretory (Wolffian or Gartner's) duct, which are likewise found after birth in the broad ligament. Of these persistent tubular remnants of the Wolffian bodies—the atrophied representatives of such portions of the mesonephros as did not enter into the formation of the internal genital and urinary organs of the female—two groups are distinguished, corresponding to the two divisions of these embryonic glandular organs of Wolff, recognized by Müller, Banks, Bornhaupt, Waldeyer, and others. These observers distinguished (1) the *sexual* (Bornhaupt) from (2) the *primitive renal* portion of the Wolffian bodies, the atrophied vestiges of which are respectively

represented by (1) the "parovarium" of Kobelt—also called the epoöphoron (Waldeyer) and the organ of Rosenmüller—which corresponds to the epididymis of the male; and by (2) the "paroöphoron" of His and Waldeyer, the homologue of the organ (*le corps innominé*) of Giraldès or paradidymis of Waldeyer.

The *parovarium* can be exposed to view by carefully removing the posterior layer of that part of the broad ligament lying between the ovary and tube, called the ala vespertilionis; and for such dissection the normal organs of a young adult virgin answer best, we are told by Doran.[1] Or, should a multilocular glandular cyst of the ovary be removed before it has undergone inflammation or contracted adhesions with the surrounding structures, the parovarium will show clearly when that portion of the cyst-wall upon which the elongated tube and stretched broad ligament rest is viewed by transmitted light. This organ will then be found to consist of a cluster of delicate converging strands, representing the upper or anterior tubules of the Wolffian body—that is, of its "sexual" portion; the whole group presenting somewhat the form of an inverted triangle, the base of which is directed toward the Fallopian tube, while its truncated apex terminates in the ovarian hilum. Though but ten to fifteen tubes are usually seen, as many as twenty-four have been observed by Doran in a case where the corresponding ovary had undergone cystic degeneration; in fact, ovarian disease always renders the parovarian structures more distinct. From the hilum of the ovary, in which these vertical tubes of the parovarium are lost, they radiate upward, and finally terminate in a horizontal tube or efferent duct, which constitutes the duct of Gartner, and is both more persistent and better developed in some of the lower mammalia than in woman.

From its outer blind extremity, which frequently undergoes cystic enlargement, and is then usually pedunculated, though not necessarily so, the duct of Gartner has been traced by Coblenz[2] and others, in woman and in domestic animals, across the broad ligament to the uterus, and through the walls of this organ and the vagina to the urethra, where it terminates.[3] The diameter of the vertical tubes of the parovarium ranges from 0.3 to 0.5 mm.; while their walls, 0.05 mm. in thickness, consist of fibrous tissue disposed in two layers—an outer one of circular fibres, and an inner one, the component fibres of which have a longitudinal arrangement. In the most perfectly preserved of these

[1] It has been the writer's privilege to examine the beautiful specimens illustrating the normal and morbid anatomy of the broad ligament which were prepared by this investigator for the museum of the Royal College of Surgeons, London.

[2] Comp. *Virchow's Archiv*, Bd. lxxxiv. S. 26.

[3] Whether the fine tubules opening at the external orifice of the urethra really represent the lower ends of Gartner's ducts, or simply the outlets of the urethral glands described by Skene (*Amer. Journ. of Obstet.*, vol. xiii. p. 265), is still a mooted point.

tubules the lining is composed of ciliated columnar epithelium, in a single layer; though usually their lumina contain merely a granular detritus, representing the remains of the broken-down epithelium, with occasional patches of low columnar epithelial lining. According to Coblenz, the duct of Gartner, when perforate, is lined with cylindrical epithelium, though Doran's observations indicate that the cells are very flat, approaching the endothelial type.

The *paroöphoron* of Waldeyer—which, as we have seen above, corresponds to the organ of Giraldès or paradidymis in the male, and which represents the atrophied tubular remains of the lower, posterior, or primary renal portion of the Wolffian body—may likewise be disclosed by carefully dissecting the broad ligament of an adult woman, and will be found lying between the parovarium and uterus, often extending to the very border of the latter. The organ consists of a group of narrow, anastomosing tubules, filled with epithelial cells and their débris,[1] and is by no means as well marked as the parovarium.

The expression "parovarian cyst" has been most freely used in the past, any cystic tumor of the broad ligament which was evidently not of ovarian or tubal origin, and which answered to certain general requirements of an anatomical and clinical nature, having been placed in this category, regardless of genetical distinctions. Now, however, inasmuch as we know that not merely the parovarium, but the paroöphoron, and, in fact, any point of the broad ligament, may be the scene of these dropsical distensions, it is far better to speak of them generally as "cysts of the broad ligament," reserving the term "parovarian" for those special cases in which it may properly be employed.

Of almost constant occurrence is a pedunculated pyriform cyst, attached to the Fallopian tube by what appears to be one of the fimbriæ; though, in reality, it represents the dilated blind extremity of Müller's duct, the pedicle being the imperforate portion of the duct lying beyond the infundibulum, or abdominal orifice of the tube. This cyst, which is homologous to the "hydatid of Morgagni," never undergoes any special pathological enlargement, and is lined, according to Doran, with a single layer of flat epithelial cells instead of the ciliate epithelium of the tube (Fig. 340). While this hydatid of Morgagni is often confounded with a sessile cyst of the broad ligament which develops on the mesial side of the fimbria ovarica, the two are quite distinct and may occur simultaneously, as shown in the following cut. Attention has already been directed to the fact that the blind extremity of Gartner's duct also is frequently converted into a cyst. When pedunculated, as it usually is, such a cyst never reaches any great size, since its pedicle easily becomes twisted and is poorly provided with blood-vessels; occasionally, however, it continues its intra-ligamentous growth,

[1] Waldeyer: *Eierstock und Ei*, S. 142.

forcing asunder the peritoneal folds of the broad ligament, and finally forming a typical parovarian cyst. It would be quite impossible, however, in the last two instances to distinguish the parovarian from the non-parovarian cyst, except in the early stages of their growth; since

FIG. 340.

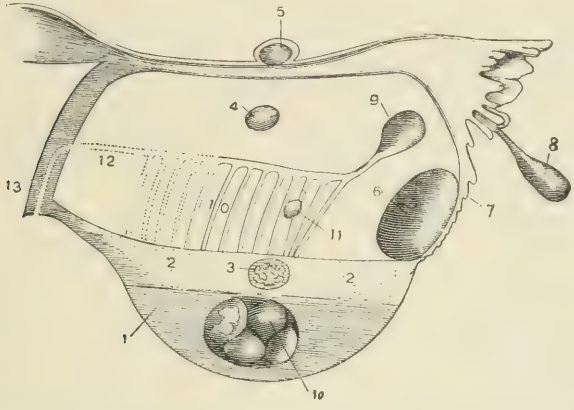


Diagram of the Structures in and adjacent to the Broad Ligament (Doran): 1, free portion of the ovary, the seat of a simple or glandular cystoma, 1*a*; 2, ovarian hilum, with 3, a papillomatous cyst; 4, cyst of the broad ligament, independent of Wolffian structures and tube; 5, a similar broad-ligament cyst, lying above the tube, but having no connection with it; 6, a cyst developed close to 7, the ovarian fimbria; 8, hydatid of Morgagni; 9, cystic enlargement of the horizontal tube of the parovarium; 10, parovarium, the dotted lines representing the inner portion, which is always more or less obsolete in the adult; 11, a small cyst of a vertical parovarian tubule; 12, duct of Gartner, often persistent in the adult as a fibrous cord; 13, continuation of the duct in the uterine wall, from which Coblenz asserts that parauterine glandular cystomata may develop. Cysts 4, 5, 6, 8, and 9 are always lined internally with a simple layer of endothelium; while cysts of the vertical parovarian tubules have a lining of cubical or ciliated epithelium, and, as in the case of hilum-cysts, 3, are prone to develop papillomatous growths.

in the character of their lining, as in all other respects, they are seemingly identical—a fact which supports the above nomenclatural suggestions. It is not merely in the immediate neighborhood of the ovarian fimbria, however, that cysts having no connection with ovary, parovarium, or tube develop. They may make their appearance in any portion of the broad ligament, either above or below the tube; they may be sessile or pedunculate, minute or of considerable size, single or more or less numerous; and, as in the above instance, they may sometimes come to resemble those developing from the efferent duct of the parovarium. In attempting to explain the genesis of these non-parovarian and widely-distributed cysts of the broad ligament, Waldeyer assumes that, during the embryonic period, patches of germinal epithelium, scattered over the surface of the broad ligament, become surrounded by the connective tissue of the part in its growth; and that, in all probability, such capsulated remains may later undergo cystic change. According to this theory, such cystic tumors of the

broad ligament would correspond to dropsical ovarian follicles. Doran refers to a "cystoid" degeneration of the broad ligament which has come under his observation, where small, cyst-like bodies appear as the result of localized serous transudation. In such cases the interference with the circulation, to which this effect is due, is frequently caused by the traction of uterine tumors, the cysts disappearing when the parts are restored to their natural position by the removal of such growths. Small cysts arising from the vertical tubes of the parovarium (see Fig. 340), or from those of the paroöphoron, are quite common; though it is by no means unusual to find them of such a size as to call for removal, some even rivalling the ovarian cystomata in their dimensions. Of two hundred and eighty-four tumors of the ovary and parovarium operated upon by Olshausen, over 11 per cent. originated in the latter organ. These cysts are generally lined with ciliated epithelium; though this is often replaced, in whole or part, by non-ciliate columnar or cubical cells, the cilia tending to disappear with the growth of the tumor, and probably in consequence of the increasing pressure of its fluid contents.[1]

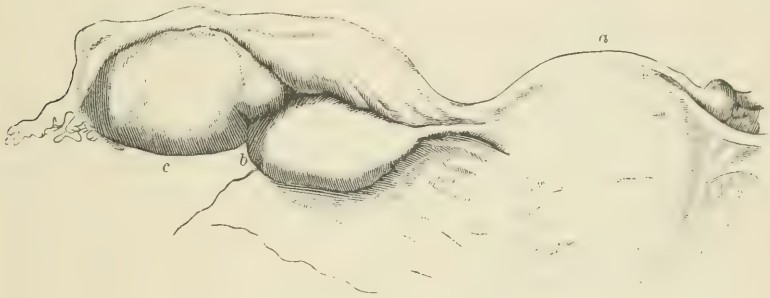
But it is not merely in the character of their lining that the cysts in connection with the vertical canals of the parovarium differ from simple cysts of the broad ligament: they are also distinguished by the fact that papillary growths are apt to develop on their inner surfaces. This latter tendency, however, is nowise remarkable; it is merely what one would predict after reflecting upon the fact that the lower ends of these same vertical tubes enter the ovarian hilum, and there give rise to the papillary cystomata which are so characteristic of that region. (See Pl. IV. Figs. 4–6.) Though by no means common, such papillary cysts of the parovarium are seen with sufficient frequency to be quite familiar to the pathologist, the ovary remaining free from disease. Clinically, they exhibit the same destructive and malignant qualities as their ovarian congeners; the papillary formations manifesting a disposition to perforate the wall of the cyst and proliferate luxuriantly over the adjacent organs, invading, with the aid of intestinal peristalsis perhaps, any portion of the peritoneum, whether visceral or parietal. This unfortunate possibility militates against the more general adoption of the simplest treatment in the case of broad-ligament cysts—that by tapping—since parovariotomy is probably preferable to the risk of peritoneal infection incurred in the former operation. As for multilocular cystomata of the glandular type, they have never yet been observed in the broad ligament, save in those exceptional cases of ovarian origin which develop in that direction instead of toward the

[1] For more detailed descriptions of these growths the reader is referred to Spiegelberg, *Arch. f. Gyn.*, Bd. i. S. 482; also Fischel, "Ueber Parovarialcysten und parovarielle Kystome," *Arch. f. Gyn.*, Bd. xv. Heft 2.

abdominal cavity. Glandular depressions lined with columnar epithelium have, however, been observed by Fischel in the wall of a parovarian cyst.

These tumors of the broad ligament are almost invariably unilocular, though polycysts do occur. Theoretically, there certainly seems to be

Fig 341.



Cyst of the Parovarium: *a*, uterus; *b*, ovary; *c*, tumor (Bantock).

no reason why two or more of the tubular relics of the Wolffian body should not undergo dropsical distension at the same time and from the same cause, forming by their growth a single tumor having a corresponding number of loculi: that this should be of comparatively rare occurrence, however, can be easily understood when the actual condition of these atrophied remains is considered. Bantock[1] describes such a parovarian tumor, composed of two cysts, which was removed by Wells, each of the component sacs being filled with limpid, slightly opalescent fluid. Another instance of polycystic tumor of the parovarium occurred in the practice of Mr. Lawson Tait.[2] The patient was a widow aged sixty-six, suffering from what was deemed a unilocular Wolffian cyst. Upon operating, however, the tumor, which sprang from the parovarium and involved neither tube nor ovary, was found to be made up of five or six sacs, the walls of which were so thin as to resemble tissue-paper. In point of size the cystic tumors of the broad ligament differ greatly, most being quite minute, others medium, while a few are of considerable bulk. Thus, Thomas is in possession of a cyst, dried and stuffed with cotton, which measures twenty-six inches in circumference; this, though, is by no means the largest on record.[3] While exceptions occasionally occur, the cyst-wall is very thin, as a rule; and in any case the thickness is uniform. It is formed of a layer of fibrous tissue containing smooth muscle-fibres (Spiegel-

[1] "On the Pathology of Certain So-called Unilocular Ovarian Cysts," *Trans. of Lond. Obstet. Soc.*, vol. xv., 1873.

[2] *Op. cit.*, Amer. ed., p. 166.

[3] Courty (*op. cit.*, Amer. ed., p. 744) removed nearly fifty quarts of fluid from what he had every reason to suppose was an enormous cyst of the broad ligament.

berg, Fischel), while the outer surface of the wall is covered with peritoneum. Within is a layer of ciliated or columnar epithelium, in the case of most Wolffian cysts; though those of the efferent tube of the parovarium, as well as other simple broad-ligament cysts, are lined with flat pavement cells, according to Doran. The peritoneal coat, with its fine tracery of delicate blood-vessels, imparts a greenish-white hue to the exposed cyst, and is generally quite movable upon the subjacent stratum of fibrillar connective tissue. The latter fact renders feasible the removal of parovarian cysts by enucleation, the treatment first employed by Miner[1] in the case of ovarian tumors. By incising the serous covering, the cystic tubule may be shelled out of the broad ligament; though, for various reasons, the range of this operation is quite limited. In the first place, even when the tumor is sessile, a good pedicle may usually be formed by traction, and, should the growth be of moderate size, its removal by ligation may be effected, as suggested by Tait,[2] without the simultaneous ablation of either tube or ovary; again, the frailty of the wall may render enucleation impracticable; or, finally, this measure may be defeated by the deep subserous development of the cyst, which necessitates its separation from the pelvic and abdominal viscera.

The contents of these cysts of the broad ligament usually comprise a thin, limpid, colorless, and generally opalescent, watery fluid, having a low specific gravity, averaging about 1005; a faintly alkaline reaction; little or no albumen or paralbumen; and, finally, very few formed elements. In some exceptional instances, however, the usual proportion of organic and inorganic solid matters present increases from about 2 or 2½ to 8 per cent., and even more; the specific gravity may exceed 1030; the contents may be thick, opaque, tough, and discolored, resembling the colloid of ovarian cysts; while blood may be present in the form of clots or uniformly diffused through the fluid, the result of torsion, puncture, or papillomatous growths. As these tumors of the broad ligament develop in a posterior direction, they separate the serous layers of the mesosalpinx, till finally this fold is entirely obliterated and the tube becomes to a greater or less extent incorporated with the cyst-wall, lying between its peritoneal and fibrous coats, where it can easily be seen and felt. While the infundibulum may remain somewhat movable, it is usually closely attached to the tumor; and even the fimbriæ, their folds being effaced by the same stretching process, radiate from the widely-dilated ostium in intimate connection with the cyst. In this way, the infundibulum being on the outer and posterior aspect of the tumor, the tube is stretched across its anterior surface, sometimes measuring twelve, or even sixteen, inches in length. The tubal digitations are also lengthened, the ovarian fimbria being at times four inches

[1] *Buffalo Medical and Surgical Journal*, 1869, p. 420. [2] *Op. cit.*, p. 165.

long. While the tube is rendered somewhat more slender by the traction to which it is subjected, its lumen is not obliterated or even stenosed as a rule; indeed, its abdominal orifice may be so dilated as to admit the tip of one's finger. According to Bantock, the stretching of the tube across the anterior face of the cyst is due to the fact that the tubo-ovarian fold and uterus oppose the further lateral unfolding of the broad ligament by the growing tumor; and, inasmuch as these represent the respective attachments of the outer and inner ends of the tube, a greater separation of these points by the enlarging cyst would necessarily mean the stretching of the intervening oviduct. "Thus," says Bantock, "the tube may be likened to an elastic band half encircling an elastic bag to which its ends are attached."

The ovary is generally unaffected, lying below the cyst and separated by it from the tube (Pl. IV. Fig. 5). Should the tumor in its intraligamentous development pass below the ovary, however, the latter projects from its lower and posterior wall somewhat as the tube does from its upper and anterior. When the cyst becomes very large and tense, the ovary may be crowded down into Douglas' cul-de-sac, or rendered so narrow and thin by stretching as to be quite overlooked. At times its identity is disclosed by the detection of Graafian follicles in sections made through a thickened area of the cyst-wall which represents its probable site. While the development of such a tumor in a posterior or anterior direction, and at the expense of the corresponding serous layer of the broad ligament, is well illustrated in Pl. IV. by Figs. 7 and 8 respectively, the relations of the growth to ovary and tube are not in accord with the foregoing descriptions, particularly in the former instance. In each case the mesosalpinx should be represented as more or less unfolded, while in Fig. 7 of the plate the cyst should protrude between the tube and ovary, rather than below the latter organ. Cysts of the broad ligament occur with special frequency during the period of sexual activity; and their growth is extremely slow, both primarily and after rupture or puncture. The latter fact has doubtless tended to swell the list of cases in which a radical cure has followed tapping or electrical treatment; and it is probable that many of these alleged recoveries have been followed by the reappearance of the disease in the course of months or years. Rupture of these tumors, both spontaneous and traumatic, is of frequent occurrence, but is seldom followed by symptoms of peritoneal irritation, the bland fluid being quickly absorbed and afterward eliminated, largely through the urinary organs. Inflammation of the cyst-wall, on the other hand, is quite unusual; while the extra-peritoneal development of the tumors and the absence of a suitable pedicle protect them wellnigh, though not entirely, from torsion and its effects. In short, the conditions which favor the supervention of adhesive peritonitis to such an extent in the case of the ovarian

cystomata are now almost inoperative; and for that reason it is extremely seldom that parovarian or other cysts of the broad ligament, even those of the largest size, are found adherent to any of the adjacent structures.

Finally, to recapitulate, the following are some of the major points of distinction between cysts of the broad ligament, commonly denominated "parovarian," and those of ovarian origin, though in exceptional instances, as we have seen, they are not entirely applicable:[1]

Extra-ovarian.	Ovarian.
Peritoneal coat easily stripped off.	*Peritoneal coat* cannot be stripped off.
Ovary usually healthy, and discharging its functions.	*Ovary* always diseased, and not discharging its functions.
Tumor most frequently unilocular.	*Tumor* always multilocular.
Fluid limpid, opalescent.	*Fluid* viscid, greenish, or brownish.
Specific gravity very low, never exceeding 1010.	*Specific gravity* always exceeding 1010.
Mucin scanty.	*Mucin* abundant.
Colloid always absent.	*Colloid* most frequently present.
Fallopian tube almost invariably attached, and stretched to several times its normal length.	*Fallopian tube* most frequently separate, seldom increased in length, and never exceeding six to eight inches.

Tubo-ovarian Cysts.

It is fitting at this point to say a few words concerning a peculiar cystic formation which occasionally comes under the observation of the surgeon and the pathologist, and is, in its general outline, more or less forcibly suggestive of that familiar form of chemical apparatus known as a retort. In this case, however, the bulb is represented by an ovarian cyst, the curved beak or stem by the communicating Fallopian tube; and it was in recognition of its compound structure that Ad. Richard,[2] who first described this form of tumor, bestowed upon it the name tubo-ovarian cyst (*kyste tubo-ovarien*). By such a cyst, then, we understand one whose walls are formed partly by the tube, partly by the ovary, though the bulk of the tumor is always furnished by the latter organ.

As we shall see in discussing the genesis of these interesting cysts, the abdominal orifice of the tube is closed during the early stage of their formation; and, just as in the case of uncomplicated tubal dropsy, the secretions of the oviduct accumulate on the proximal side of the obstruction and gradually distend the tube toward its uterine orifice.

[1] Bantock: *op. cit.*

[2] "Sur la communication des certains kystes de l'ovaire dans la trompe utérine," *Mémoires de la Société de Chirurgie*, tome iii., 1853; also *Bulletin de l'Académie de Médecine*, 1856, p. 356. Comp. Labbé: *Bull. de la Soc. anat. de Paris*, Mai, 1857.

Should the fluid finally reach the latter opening, it gushes into the uterus and is discharged *per vaginam*, the pressure of the abdominal walls maintaining the flow till the tube and any ovarian cyst with which it may have become connected are emptied. Such evacuations may take place from time to time, and occasionally occur at somewhat regular intervals, constituting the condition known as *hydrops ovariorum profluens*.[1] Boinet[2] describes an interesting case in which a tubo-ovarian cyst was thus drained; and a similar experience has fallen to the lot of both Wells and Anderson.[3] The latter surgeon had appointed a date on which he purposed to relieve the sufferings of his patient by tapping; but, ere the hour set for the operation had arrived, the woman apprised him of the fact that her distress had vanished, in consequence of a profuse flow of urine. The patient's death, which took place suddenly some six months later during an attack of pulmonary hemorrhage, enabled Mr. Anderson to ascertain the fact that a large cyst, having thick walls and including some secondary sacs, was lying collapsed and loose in the abdominal cavity. When opened it was found that the empty sac communicated freely with the Fallopian tube, uterus, and vagina.

Instead of being distended throughout its entire length, however, only the outer or distal portion of the tube is usually thus affected in the case of tubo-ovarian cysts; while at times the enlarged and lengthened oviduct, being firmly attached along its lower border to the fixed broad ligament, pursues a tortuous course. The ovarian portion of the tumor, on the other hand, may be formed by a dropsical follicle, a corpus luteum which has undergone cystic change, or by an ordinary proliferating cystoma, the main cyst usually communicating with the tube in the latter case. Thus, while the cyst is usually unilocular, this is not always the case; and even Richard, in describing one of the eleven cases of tubo-ovarian cysts which came under his observation, says: "La poche ovarienne n'était pas très considérable, elle etait multiloculaire." Similar cases, in which the dilated abdominal extremity of the tube opened into one of the loculi of an ovarian cystoma have come under the observation of Rokitansky,[4] Hildebrandt, Richard, Blasius, Olshausen, Burnier, and Lober. In point of size, tubo-ovarian cysts vary markedly. While their dimensions are moderate in most instances, they may equal in bulk the uterus at term.[5] Both ovaries and tubes may be affected; though this is quite exceptional, the disease being unilateral in the great majority of instances. As to the frequency of their

[1] *Vide* Blasius: *Commentatio de hydrope ovariorum profluente*, Halæ, 1834.

[2] "Maladies des Ovaires," *Arch. générales*, 1874.

[3] Quoted by Wells, *op. cit.*, p. 35.

[4] "Ueber Abnormitäten des Corpus luteum," *Allgem. Wien. med. Zeit.*, Aug. 30, 1859.

[5] *Vide* Hildebrandt: *Die neue gynäkologische Universitätsklinik und Hebammen-Lehranstalt zu Königsberg*, Leipzig, 1876, S. 109.

occurrence, Olshausen states that he has met with tubo-ovarian cysts three times in performing three hundred ovariotomies, the tumor being bilateral in one instance.

The point at which the union between the oviduct and ovarian cyst occurred is generally marked by a more or less constricted annular aperture, through which the mucous lining of the tube becomes continuous with that of the ovarian cavity. The fimbriæ may have disappeared entirely, or in some cases they are seen spreading over the outer surface of the cyst-wall. Usually, however, they appear upon the inner surface as radiating continuations of the longitudinal tubal folds of mucous membrane, and may almost meet at the opposite pole of the cyst; or they float freely in the fluid contents of the tumor. In one case, described by Burnier, the ends of the fimbriæ alone were attached to the inner surface of the cyst, the central portions remaining free.[1]

Excepting the more or less limited area formed by the extra-peritoneal portion of the ovary, the outer surface of a tubo-ovarian cyst is covered by the peritoneum. The wall of the tubal portion is largely made up of smooth muscular fibres; though, when the distension is considerable, these are forced asunder and tend to disappear. Upon the inner surface is a layer of ciliated columnar epithelium; that is, in the early stages of the disease. Later, however, the cilia vanish; and, just as in the case of the ovary, the cellular lining changes from the columnar to the squamous type in consequence of the increasing pressure of the fluid contents. The histology of the ovarian portion of the cyst has already been discussed at length.

The contents of tubo-ovarian cysts are by no means of a uniform character: they vary with the nature of the ovarian component, the occurrence of hemorrhage, suppuration, and other changes. A thin, limpid serum containing few morphological elements may be present; or the fluid may be quite thick, and of any shade, ranging from a light yellow to a deep chocolate, the different colors being due to the presence of epithelial cells, pus, and blood. Sometimes the blood is found in a fresh state; again, it forms grumous masses, or clumps of pigment and hæmatoidin crystals may alone attest the fact that hemorrhage has occurred in the past.

Genesis.—The endeavor to account for the origin of tubo-ovarian cysts has led to the advancement of various theories; but of these no single one is found to be universally applicable, and it becomes more and more evident that to explain the genesis of these tumors in a satisfactory manner necessitates the adoption of several distinct views, which it will be impossible to discuss thoroughly in the present article.

[1] *Vide* Burnier: "Ueber Tubo-ovarialcysten," *Dissert. inaug.*, 1880; also, "Zwei neue Fälle von Tubo-ovarialcysten," *Zeitschr. f. Geb. u. Gyn.*, Bd. vi. S. 87.

According to Richard, the ovary is clasped by the fimbriated extremity of the Fallopian tube; the ovum and fluid contents of the ripe ovisac are discharged into the ostium abdominale; but, in consequence of some morbific agency, the normal course of events is then interrupted. Instead of closing and forming a corpus luteum, the diseased follicle remains open, and continues to pour into the tube the morbid fluid with which it is distended; that is, the follicle becomes converted into an ovarian cyst, which, with the distal extremity of the attached oviduct, constantly increases in size. In this manner a tubo-ovarian cyst is formed. While indorsing Richard's theory on the whole, Klob directed attention to the fact that the ovarian portion of the cyst is always much larger than the tubal; although the dense ovary would seemingly be much slower to yield to the increasing pressure of the fluid within the common cavity than would the tube. In order to overcome this objection, Klob suggested as a possibility that an ovarian cyst develops from a corpus luteum, and bursts into the end of the adherent tube. But to secure this firm union between the abdominal orifice of the tube and the ovary before the bursting of the cyst, a circumscribed peritonitis at least must be present; and, should this be admitted in the case of Klob's cystic corpus luteum, it would also be true, as Burnier claims, of other cystomata, regardless of their histogenetical differences. Lober attempts to reconcile this latter assumption with Richard's original theory in two ways:[1] first, a tubo-ovarian cyst having formed from the rupture of a ripe ovisac into the adherent tube, other Graafian vesicles become dropsical, and finally we have the ovary converted into a multiple cystoma of Rokitansky (see Fig. 324); second, a multilocular ovarian cystoma forms, and subsequently a follicle in an uninjured portion of the organ reaches maturity, is grasped by the fimbriated extremity of the tube, bursts, and then unites with the latter organ to form a tubo-ovarian cyst.

But Richard's assumption, that the ovary is embraced by the morsus diaboli when a follicle ruptures, is disputed by many competent authorities; and Veit,[2] who was the first to oppose the former's views, declares that this active co-operation of the oviduct has never been observed, and that the above theory fails to account satisfactorily for the presence of fimbriæ upon the inner surface of the cyst, their most common location. Veit assumes, instead, that the disease begins as a catarrh of the tube and Graafian follicle, in consequence of which the two organs become firmly united, and that these two contiguous cavities subsequently communicate with each other. This is the so-called "catarrhal theory," which, with certain modifications, is now widely accepted.

The results of a catarrhal salpingitis vary with the seat of the dis-

[1] Consult Lober: "Doppelseitige Tubo-ovarialcysten," *Inaug. Dissert.*, Berlin, 1886.

[2] *Krankh. d. weibl. Geschlechtsorg.*, Erlangen, 1867, S. 481.

case. In the uterine and middle portions a simple narrowing of the lumen is the usual consequence; but, when the inflammation reaches the infundibulum, a complete closure of the abdominal orifice is frequently effected by the union of the fimbriæ. The inner surfaces of these laciniæ are covered with columnar epithelium, and so cannot unite until deprived of their cellular coating; but upon the opposite sides is a layer of peritoneum, and we know that serous surfaces are prone to adhere. In the course of an inflammation involving these parts, then, the fimbriæ, with the exception of the fimbria ovarica, bend inward till their extremities point toward the uterus, and they seem about to enter the tube itself. Now their serous surfaces are apposed and unite, so that the abdominal orifice of the tube is closed. This inward bending of the fimbriæ is ascribed, in part at least, to the action of their muscular fibres by Reboul,[1] the muscular contractions being excited by the irritating effects of the inflammation. Should fluid now collect in the tube, its outward pressure results in the partial protrusion of the inverted fimbriæ; so that the end of the tube presents a rosette-like appearance, there being in the middle a funnel-shaped depression surrounded by small nodular elevations. The adhesion of such an inflamed and occluded tube-end to a growing ovarian cyst of any kind, followed by the communication of the two diseased sacs in consequence of pressure-atrophy and distension, would result in the formation of a tubo-ovarian cyst. The fimbriæ, being liberated by the tension of the more rapidly-enlarging ovarian cyst, would tend to invade its cavity, and either float freely in its fluid contents or become more or less adherent to its walls. In Reboul's opinion the inflammatory changes in these cases involve the tube first, the ovary next: should the direction of the inflammation be reversed, proceeding from the ovary to the tube, a tubo-ovarian cyst rarely results.

The various theories which we have thus far considered attribute the genesis of tubo-ovarian cysts to changes occurring after birth, but they fail to account satisfactorily for all cases. Thus, in some instances the fimbriæ are entirely absent, no traces of them appearing outside of or within the cysts; while at the same time it is evident that inflammation has never been present in the affected region. To explain the intimate fusion of tube and ovary in such cases, both Schneidemühl and Beaucamp, who investigated the question independently of each other and announced their conclusions in 1883 and 1884 respectively, assumed a faulty intra-uterine development (vitium primæ formationis). The former believes that at an early period of embryonic life the tube fails to open into the abdominal cavity, but becomes merged in the ovary; while Beaucamp, expressing the same idea in different words, assumes the formation of an "ovarian tube," by which he understands one whose

[1] "Ueber Tubo-ovarialcysten," *Dissert. inaug.*, Berlin, 1885.

abdominal end is so fused with the corresponding ovary that no sharply-defined line of demarcation exists between the two organs, the tube being closed by the ovary itself. Concerning the changes which result in the formation of a tubo-ovarian cyst from such an undeveloped oviduct, neither of these investigators seems to entertain very clear ideas; Reboul, however, is more satisfactory in this respect. The latter, in describing the formation of such a cyst, assumes primarily the existence of a "congenital ovarian tube," though one has never been actually seen. The next essential appears to be a cystic or cystoid degeneration of the ovary, followed by dropsy of the distal portion of the tube. Finally, the septum intervening between the ovarian cyst and the lumen of the tube becomes perforated and is completely absorbed, though whether the erosion takes place on the tubal or ovarian side of the partition is as yet unsettled.

Beaucamp asserts that ovarian pregnancy may occur in these congenital cysts, mature ova escaping from surrounding uninjured Graafian follicles into the ovarian cavity, and there becoming fertilized. In all probability the circumscribed peritonitis which causes the union of tube and ovary is frequently the result of gonorrhœal salpingitis; and especially is this true of bilateral tubo-ovarian cysts.

Dermoid Cysts of the Ovary.

Attached to the surface of the body, or more or less deeply imbedded in it, peculiar congenital formations termed *teratomata* or *teratoid tumors* are occasionally met with, the distinguishing feature of which is the fact that they are compounded of various tissues not normally found in these localities. That is to say, these tumors are heterologous —not in the limited sense which justifies the application of this epithet to chondromata of the testis, ovary, or parotid gland, but from the fact that they may contain not cartilage merely, but fibrous tissue, bone, fat, muscle, glandular structures, skin, hair, nerves, and simple embryonic cellular tissue. At times it is quite evident that such a congenital growth represents an undeveloped fœtus: its shape perhaps, or the presence of rudimentary skeletal and visceral structures, suffices to prove its genesis. In such a case two rudimental embryos have originated in a single ovum; but one twin, attached to and deriving its nutriment from the other, has fallen behind in the race, and its stunted remains form a mere parasitic appendage to the surviving fœtus (autosite or host), or become surrounded and enclosed by it. The teratoma in such a true double monster, when visible from without, is generally attached to the lower end of the spine, to the head, neck, anterior thoracic or abdominal wall.

On the other hand, however, the great majority of teratomata differ

in several essential features from the true fœtal monstrosities which we have just considered: their shape is nowise suggestive of an ill-developed human being; even the rudiments of organs, in the formation of which the hypoblast shares, are generally wanting; they have a cystic form; and, finally, their inner lining resembles more or less closely the outer skin, the attributes of which are frequently present. It was to these tumors which form the subject of the present section that Lebert, influenced by their two most constant and characteristic features, gave the name "dermoid cysts." These peculiar formations are found in various parts of the body, as in the orbit, neck, perineum, brain, anterior mediastinum, lungs, mesentery, peritoneum, stomach, kidney, bladder, testicle, scrotum, and other localities;[1] but it is in the ovary that they occur most frequently, 129 out of 188 dermoid cysts reported by Lebert affecting that organ.

Ovarian dermoids present great variations in point of size, being at times quite minute, while again they may even exceed a man's head in bulk. As a rule, however, the growth of these cysts ceases after a time, and they remain stationary, any further increase in the size of the patient's abdomen being the result of ascites due to the irritating effects of the tumors upon the peritoneum. While but one ovary is usually involved, cases in which both glands are the seat of dermoid cysts are observed with comparative frequency. Thus in 31 cases of this disease observed by Doran, 7 were bilateral, while Olshausen found both ovaries affected in 4 out of 16 operations undertaken for the removal of these growths. Koeberlé's statement, that the right ovary is more frequently involved than its fellow, has not been substantiated by subsequent investigations. The cysts may be either single or multiple, three or more being found in some cases springing from one ovary; and at times these primary and contemporaneous cysts may communicate with each other, their contiguous walls becoming atrophied from mutual pressure in the manner already described. In no case, however, does true proliferation take place; the cysts remain simple or unilocular save in certain rare instances of which we shall have occasion to speak later, though even then the exceptions are apparent rather than real.[2]

As to the time which marks the occurrence of dermoid cysts of the ovary, no age is exempt; they have been found in the fœtus of eight months as well as in the aged. Roemer of Berlin has even operated successfully upon a child aged twenty months, removing an ovarian

[1] For details consult Meckel, "Mémoires sur les Poils et les Dents qui se développent accidentellement dans le Corps." *Journ. compl. du Dict. des Sciences méd.*, t. iv. pp. 122 et 217.

[2] It has been claimed by Ritchie (*Ovarian Physiology and Pathology*, London, 1865) that multilocular dermoid tumors are always formed by the secondary growth of partition-walls within the primary unilocular sacs—a view in which Tait concurs.

dermoid as large as the patient's head;[1] while Potter, in examining *post-mortem* the body of a woman eighty-three years old, found a similar growth, which, though weighing eighty-nine ounces, had occasioned no symptoms during life. It appears that up to the period of puberty the dermoid occurs oftener than any other form of ovarian tumor; in the early years of sexual maturity, however, cysts with serous contents, chiefly those of the broad ligament, exceed the former in number; while after the twenty-fifth year the proliferating cystomata predominate. Considered by themselves, however, and not relatively, ovarian dermoids are observed most frequently from the fifteenth to the forty-fifth year of life; that is, during the season of potential reproductiveness. That this is so should excite no surprise; for when one reflects upon the mighty changes, both developmental and functional, which take place in the reproductive organs of the female during this period, it seems but natural that these congenital dermoids of the ovary should respond then, if at all, to the local stimulating influences, and either begin to grow or grow more rapidly. The imperfect development of the genitalia which has been observed quite frequently in the victims of this disease seems to be more than a mere coincidence, and results, in all probability, from the injurious influence exerted upon the ovary by the tumor. Occasionally, however, an opposite condition obtains, markedly precocious children being sometimes afflicted with these growths. While the experiences of the leading operators exhibit great differences in respect to the prevalence of dermoid cysts, it is probable that they comprise from 4 to 5 per cent. of all ovarian tumors.

The bright, glistening appearance presented by the fresh surface of a glandular cystoma is absent in the case of dermoid cysts, a dull and often brownish hue replacing it. Though at times very delicate, the walls of these growths are usually quite thick; while the inner surface is either smooth or raised here and there into prominences of variable height and area, as shown in the accompanying illustration (Fig. 342). These elevated patches, which resemble the outer skin, lie several millimeters above the adjacent parts. The inner lining of the cyst-wall, which corresponds to the epidermis or cuticle, often exceeds two millimeters in thickness, and is composed of epithelial cells agglutinated together in several irregular layers. Of these latter, the uppermost, or that contiguous to the cyst-contents, is made up of large flat cells, the nuclei of which have disappeared; while below nucleated cells of a more rounded or polyhedral form appear. The deepest cuticular stratum, finally, comprises a row of somewhat elongated epithelia placed perpendicularly upon a layer of connective tissue resembling the true skin or corium, between which and the outermost lamina of firm

[1] See *Lond. Med. Rec.*, June, 1884, or *Deutsche med. Wochenschr.*, Dec., 1883.

fibrous tissue lies the panniculus adiposus. The surface of the so-called corium is frequently, though not invariably, studded with papillæ, which differ from those of the tegumentary investment of the body less in number than in their irregular size, length, and arrangement. The resemblance of the inner cyst-wall to the skin is often still further increased by the presence of other attributes of the latter. *Hairs* may spring from the entire surface, though more often their growth is limited to the prominences mentioned above (piliferous cysts). These arise from follicles, and while usually short may range from four or five inches to two feet in length (Coward, Blumenbach); indeed, they may be as long as any ever found upon the scalp (Boinet). There seems to be no connection, in point of color, between the hair within such a cyst and that upon the body, since Andral mentions the case of a negress in whom it was of a blonde and even silvery color. On the other hand, the hair may be darker than that upon the patient's external parts,[1] though usually it is fair or of a reddish cast. Frequently

FIG. 342.

Portion of the Wall of an Ovarian Dermoid Cyst: *a*, wall; *b*, elevations, composed of fatty and cutaneous tissues; *c*, hairs; *d*, teeth (Ziegler).

[1] *Vide* Doran: *op. cit.*, p. 79.

the hairs are soft and fleece-like to the touch—a circumstance which suggested for such tumors the name "trichomallomata."

Sebaceous glands are abundant, opening either normally into the hair-follicles, or beneath the epidermis, as well as upon the inner surface of the cyst. *Sudoriferous glands*, normal in position and structure, have also been observed by Heschl, Kohlrausch, and others; though these are less numerous than the sebaceous variety. But hairs, papillæ, and glands are all wanting in some dermoid cysts, although the sebaceous contents of the tumors prove that glands must have been present at some time in the past. In all probability such a condition of affairs is the result of atrophy—an assumption which the delicate, smooth walls of the cysts, with their thin cuticular linings, serve to strengthen.

Though occurring less frequently than the structures already mentioned, bone, teeth, cartilage, nervous tissue, and both varieties of muscular fibres are also met with in the walls of dermoid cysts.

The *bones* originate as delicate laminæ or spicula in the connective tissue of the cyst-wall beneath the skin-like covering, and assume in the course of their development a variety of irregular shapes. At times they present a marked resemblance to the flat bones of the skull in their rudimentary condition; and when, as is frequently the case, teeth are found imbedded in them, together with empty sockets, their analogy to the jaw-bones is forcibly suggested. While of a genuine osseous structure, the texture of these bones is usually more compact than cancellous. Rarely, two or more pieces are found joined together by capsular structures, the apposed ends having cartilaginous investments. Again, the *cartilage*, which likewise arises in the subdermal connective tissue, may form small tooth-like bodies; or, forcing its way through the lining, it may project into the cavity of the cyst and appear as masses of various sizes covered merely with perichondrium. Portions of the cartilage may be undergoing ossification.

The *teeth*, whose presence constitutes one of the most remarkable features of dermoid cysts, may be attached to bone or cartilage within the cyst-wall, while their crowns extend into its cavity. Sometimes, however, their fangs are surrounded merely by connective tissue; and occasionally the entire tooth lies completely imbedded in the walls, no portion showing save when exposed by an incision. Though well formed and of a distinct type at times, they are usually faulty in point of development, shape, and preservation. They may be rudimentary, the crown, fang, enamel, or cortical substance being absent; while caries may have resulted in their partial destruction. A most striking statement anent the shape of the teeth is made by Olshausen,[1] to whom the idea was first submitted, together with proofs of its correctness, by Prof. Holländer. The former observes that the crowns of teeth found

[1] "Diseases of the Ovaries," *Cyclop. of Obstet. and Gyn.*, vol. viii.

in these cysts, like those of the oral cavity, slope gently toward the median plane of the body, and that, bearing this fact in mind, an examination of its dental elements suffices to determine upon which side the tumor originated. The importance of this proposition, as far as its bearing upon the etiology of dermoid cysts is concerned, can hardly be exaggerated, and should subsequent investigations determine its truth, the mooted genesis of these tumors will be definitely settled.

While the teeth are usually few in number, ranging from one to ten, this is not always the case. Thus, in three pieces of bone removed from the walls of a large dermoid cyst in the case of a girl thirteen years of age, Schnabel found more than one hundred teeth;[1] and Plouequet[2] records a case in which they exceeded three hundred in number. When few teeth are present, Doran states that they are usually of a canine or incisor type, the bicuspid form prevailing when the opposite condition obtains. That the teeth of dermoid cysts develop in successive crops, and in many other respects correspond to the normal dental structures, has been shown by the investigations of Meckel, and is corroborated by the experience of others. Thus, a preparation in Rokitansky's collection shows the crown of an atrophied tooth resting upon an underlying growing specimen, in a manner which forcibly recalls the natural eruption of the deciduous and permanent teeth. Wells, too, has observed this phenomena in one of his own cases. That the teeth are supplied with nerves has also been demonstrated.[3]

Nervous tissue, both gray and white, and resembling brain-substance as well as nerve-fibres, has been repeatedly found in these cysts; and the same may be said of plain *muscular fibres*, regarded by Virchow as *arrectores pili*. As to the striated fibres, however, reports are of a conflicting nature. While some deny their occurrence in true dermoid tumors of the ovary, referring such as have been observed to those teratomata which represent blighted fœtal remains, others, supported by the experience of Virchow, maintain that they do appear in the former structures, though with comparative rarity. That the proponents of the latter view are correct, however, must, in our opinion, seem more than probable to any one who acquaints himself with the more recent ideas concerning the genesis of the cysts now under consideration. According to Cruveilhier and Boinet, structures resembling nails are also found in these cysts, though only at long intervals.

The *contents* of dermoid cysts comprise such substances precisely as one versed in the structural anatomy of these growths would expect to meet with. The tumors consist, as we have seen, of closed sacs lined to a greater or less extent with a structure resembling skin and pos-

[1] Schnabel: *Württemb. Correspondzbl.*, 1841.
[2] Quoted by Becquerel (*Maladies de l'Utérus*).
[3] Salter: *Guy's Hospital Reports*, 1860, p. 241.

sessing the attributes of the latter organ. Hence, when the oily liquid secreted by the epithelium of the sebaceous glands exudes from their ducts, it is not removed by friction and various other detergent processes, as is normally the case, but is stored up within these closed cavities, producing retention-cysts analogous to comedones, milia, and wens (sebaceous), save that the gland-ducts remain perforate. During life this fatty secretion remains in a fluid condition; though in the dead body, or when exposed to the air after ovariotomy, it tends to become firm, and is frequently found in a pultaceous condition. The greasy mass within the sacs, which often resembles the *vernix caseosa*, contains, in addition to this sebaceous fluid, exfoliated epithelium, and cholesterin is frequently present in such abundance that the crystals impart a glittering appearance to the entire contents of the cysts. Oxalic acid, considerable leucin and tyrosin, urea, and a substance resembling xanthin have also been found.[1] Hairs too, either shed from the skin-like lining or still connected with its follicles, are imbedded in the smeary mixture, sometimes radiating through it in a straggling manner, again aggregated into tufts or firm roundish masses. Finally, in the case of dentigerous cysts, some teeth may be found in the same situation, instead of being attached to or imbedded in the walls of the tumor; while, at other times, fragments of bone and various tissues are thus met with. Usually, of course, the fatty contents of these dermoid cysts form a single cohesive mass, but in one instance the following anomalous condition of affairs was observed by Rokitansky: Floating in a brownish viscid fluid were seventy-two round bodies as large as walnuts and composed of fat arranged in concentric layers, while others of the same size were constructed largely of matted hair. Besides these there were present innumerable fatty globules as small as peas. Inasmuch as the pedicle of the tumor was found in a twisted condition, Rokitansky was disposed to ascribe the formation of these peculiar globules to the rotary or churning motion to which the contents of the cyst had been subjected. As Olshausen suggests, however, it is more probable that this result was due to the admixture of blood and serum with the fat. Cases similar to that of Rokitansky have since been reported by Routh, Fraenkel, Doran, and others. On one occasion the last-named observer found in each of two small dermoid cysts, present in a single ovary, a quantity of pure white sebum resembling putty.

In ovarian dermoid disease the sac rarely contains more than eight pints of fluid; and the latter may present any color, ranging from a light brown to a deep chocolate, the darker shades being the result of hemorrhagic effusion.

[1] *Vide* Bamberg: "Obser. aliquot de ovarii tumor.," *Dissert. inaug.*, Berol., 1864, p. 15.

Genesis.—But how is one to account for the origin of the dermoid cysts of the ovary? This is a query the attempted solution of which has exercised the reason and stimulated the imagination of the profession from the time of Hippocrates down to the present; and nothing in the whole range of ovarian pathology better illustrates modern progress than the evolution of the most widely-accepted theory of today from the vague conjectures of the past. To discuss the subject in an exhaustive manner, however, is manifestly impossible: the writer must rather content himself with that brief consideration which the limited space at his disposal necessitates.

In the first place, four leading hypotheses, embracing all others, have been proposed in explanation of the nature of these tumors, and may be stated concisely as follows: first, that dermoid cysts represent the results of the fecundation and limited growth of the ovum in the ovary itself; second, that this restricted development of the ovum *in loco* is quite spontaneous, the male germ taking no part in the process; third, that they are due to fœtal inclusion—*fœtus in fœtu;* and, fourth, that certain misplaced or aberrant embryonic cells grow within the ovary, and there produce these peculiar tissues in accordance with their original destiny. It will be noticed that in the first two instances the ova from which the tumors are supposed to develop are contributed by the patient; while, if we accept the view that every double monster originates in a single ovum, each of the latter two hypotheses is based upon the belief that both the cyst and its victim spring from the same ovarian cell. Let us briefly consider these four propositions seriatim:

1. While it is undoubtedly true that ovarian pregnancy does occur, and that the early death and partial absorption of the embryo might account for the existence of a dermoid cyst, still it is quite evident that such a case must constitute a rare exception. Besides, the occurrence of these growths in the male as well as in the female, in the infant as well as in the aged, in the single as well as in the married, shows that this first theory is quite untenable, though Cruveilhier thought it applicable in the case of married women. Coley and Meckel, on the other hand, claim that in adult females these pilous cysts are the result of incomplete fecundation.

2. After the maturation of an ovum, and the subsequent fertilization by one or more spermatozoa, its ability to form the various structures of the body in all their perfection is of course unquestioned. But cannot the ovum under certain conditions, the nature of which is unknown, pass through the earliest stages of development and form rudimentary masses of definite tissues without the agency of the male cell? Such spontaneous developmental energy when exhibited by an ovum has been termed the *nisus formativus* (Blumenbach), or hyperechesis; while the termination of these ovicular efforts in the production of a

perfectly-formed or viable embryo would be an instance of parthenogenesis (Gr. *παρθένος*, virgin, and *γένεσις*, birth), or *Lucina sine concubitu*. The possibility of an ovum thus undergoing partial development and forming dermoid cysts has long been recognized by the older authors. Thus, in Dr. Ashwell's opinion,[1] these growths form as a result of disappointed sexual appetite, the power of production being present in the female without receiving the stimulus of the male, and hence she throws off an imperfect production. Ritchie also regards every dermoid cyst of the ovary as a "perverted attempt at parthenogenesis;" and his views are taken up and enlarged upon by Tait, who, if not the only supporter of this doctrine among living ovariotomists, is certainly its most devoted advocate. Aside from the fact that no direct proof of its truth exists, however, this theory of the hyperechetic development of an ovum necessitates a genetical distinction between ovarian dermoid cysts and the subcutaneous variety, while it utterly fails to explain why, next to the ovary, the testis is the most frequent seat of these growths (Rindfleisch).

A view somewhat analogous to that which we have just considered is entertained by Waldeyer.[2] This observer believes that the epithelial cells of the ovary—which, from the fact that they are derived from the same germinal epithelium, are the genetical co-ordinates of the ova—may under certain circumstances produce the various tissues found in dermoid cysts. According to this theory the proliferation of the ovarian epithelium may result in the formation of an ordinary cystoma, a dermoid cyst, or possibly in carcinoma. While this hypothesis accounts very satisfactorily for the frequent occurrence of mixed tumors of the ovary, it is open to the same objections as the preceding.[3]

3. The doctrine of fœtal inclusion assumes that the rudimental embryo in a fecundated ovum undergoes complete cleavage, but that the formation of homologous twins is prevented by the unequal development of the two segments, a double monstrosity being produced instead. The connection of the blighted individual to the developed twin, however, is not symmetrical, in accordance with the general laws of teratology; but the parasite is included within the body of the host or autosite, giving rise to an ovarian dermoid cyst when attached to or imbedded in that gland ("*Kystes fœtaux par inclusion*," Boinet). In so far as this hypothesis refers the origin of every dermoid cyst to the embryonic period of life, it is satisfactory; but, while admitting that such a true teratoma may occasionally develop in this out-of-the-

[1] Quoted by T. S. Lee: *Tumors of the Uterus and its Appendages*, London, 1847.

[2] *Arch. f. Gynäk.*, Bd. i. S. 252.

[3] Waldeyer's position would certainly have been strengthened had the two incipient dermoid cysts discovered by Doran (*op. cit.*, p. 77) proved upon examination to be dilated Graafian follicles.

way organ, a moment's thought will convince any one that the explanation does not harmonize with known facts. How shall we thus account in a satisfactory manner for bilateral or multiple dermoid cysts of the ovaries? for the much greater frequency of these tumors in the female? for the evident disposition of the rudimentary fœtus to terminate its career in the ovary or testis? and, finally, for the rarity of hypoblastic structures?

4. The difficulties which beset the first three hypotheses, rendering them inapplicable save in special instances, are successfully met and overcome by the fourth. Colnheim, in attempting to explain the etiology of tumors, was led to attribute them to developmental faults, and advanced his hypothesis of "embryonic remains." This is to the effect that more cells being produced than are required for the formation of a part, the superfluous ones remain in an embryonic condition, at one point or scattered over an entire tissue. Such cells continue in a "resting" state till roused into growth by some special stimulus. Heschl first accounted for the genesis of superficial or subcutaneous dermoid cysts in an analogous manner. He maintained that portions of the epiblast became invaginated or dipped down from the surface, were then separated by the constricting force of the surrounding growing tissues, and later developed into dermoid tumors. When it was afterward demonstrated by His,[1] however, that the axis-cord from which the genital gland develops is made up of a mass of embryonic cells in which it is impossible to distinguish any individual blastodermic layer, then the theory of Heschl became applicable to dermoid cysts of the ovary as well as to the more superficial variety. Accordingly, it is now believed that in the collection of mesoblastic cells destined to form the ovary other embryonic cells from the future epiblast, surrounding mesoblast, and perhaps hypoblast, may become included. Of these three varieties, the epiblastic cells, from which the skin and its attributes, as well as the nervous tissue, are developed, are most apt to be thus misplaced—because of their exposed position probably. Next in frequency occur cells from the adjacent mesoblast, destined to form bone, cartilage, muscle, and other tissues. Rarest of all, however, are the deep cells from the future hypoblast, to which any intestinal or glandular rudiments in the cyst are to be ascribed. Such components of a potential dermoid cyst of the ovary may remain in a resting condition throughout life; they may yield to the vigorous formative forces of the fœtal or early extra-uterine periods, or their growth may be deferred till they are subjected to the powerful recurrent stimulus of menstrual congestion.

It is sometimes found that a dermoid cyst in one ovary is associated with a proliferating cystoma in its fellow-gland. Doran met with this

[1] *Untersuch. über die erste Anlage des Wirbelthierleibes,* Leipzig, 1868.

condition three times in thirty-one cases of dermoid disease. Again, a single ovary may be the seat of a mixed tumor, made up of a combined dermoid and glandular cystoma. Numbers of such cases have been observed by Schroeder, Eichwald, Martin, Wells, Olshausen, Doran, and others. In most of these the dermoid cyst formed but a single loculus of the larger cystoma; and, in all probability, the latter was a secondary growth caused by the irritating qualities of the former congenital cyst. Occasionally the dermoid sac has apparently opened into one of the contiguous colloid cavities, for the skin-like lining of the former is directly continuous with the ordinary single layer of cylindrical epithelium. Here, of course, the contents would be partly colloid, partly those of dermoid cysts. A very accurate histological study of such a case has been made by Flesch.[1]

In an ovarian tumor of considerable size, and apparently multilocular, a peculiar condition was observed by Friedländer.[2] The growth comprised numerous cysts, grouped together in an irregular manner, some of which contained sebaceous material, some a clear serous fluid. Upon examination it was found that the neoplasm represented a dermoid cyst in which secondary changes of an extraordinary character had taken place, though the main cavity was filled with the usual mass of greasy material mixed with hair. Sudoriferous glands had been converted into retention-cysts, as large as one's fist; while other sacs of various sizes were sebaceous glands, distended by their retained secretions. In combination with a dermoid cyst there may be present various other pathological conditions: the stroma is found in a degenerate state, or malignant neoplasms form more or less of the whole tumor. Thus, in a case of bilateral dermoid disease of the ovaries Kocher found that medullary carcinoma was present in one of the tumors, while unilateral cancerous cysts are described by Heschl and Wahl. In the latter's case the extension of the malignant disease necessitated the resection of the colon. The stroma, however, is much more frequently involved than the epithelial structures, and hence the majority of malignant growths attacking dermoid cysts are sarcomata. Flaischlen,[3] in examining an ovarian tumor removed by Schroeder, found it to be of a mixed type—a dermoid cyst in combination with a proliferating cystoma: the connective tissue had undergone sarcomatous degeneration. Round-celled sarcomata have also been observed in connection with dermoid cysts by Unverricht, Doran, Thornton, and others; while, in one of Bantock's cases, dark-red, firm sarcomatous masses, composed of both spindle-shaped and round cells, were found by Doran. Thornton has in several instances noticed the appearance of malignant disease in the pelvis two or three years after

[1] *Verhandl. d. physikal.-med. Gesellsch. in Würzburg*, Bd. iii. S. 111.

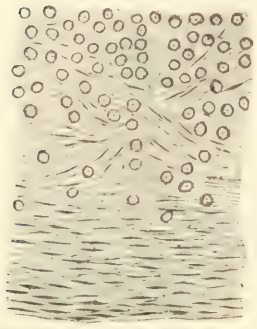
[2] See *Virch. Arch.*, Bd. lvi.

[3] *Zeitschr. f. Geb. u Gyn.*, Bd. vii. S. 449.

the removal of large dermoid cysts, in which soft, whitish masses resembling sarcomata had been present (Fig. 343).

As in the case of glandular and papillary cystomata, peritoneal metastases have been reported by several observers in connection with dermoid ovarian disease. The secondary cysts usually appear as small yellowish nodules with characteristic contents, though the precise method of their dissemination, whether through rupture of the primary ovarian growth or otherwise, is not known.

Fig. 343.



Round-celled sarcoma from a Dermoid Cyst, showing the transition from the connective tissue of the firmer portion of the tumor to the collection of round cells, with a trace of fibrillation of the intercellular substance in the softer part of the growth (Doran).

When provided with suitable pedicles, dermoid cysts are especially apt to rotate, their moderate size and firm consistence favoring the occurrence of this accident. Again, their protracted stay in the pelvis renders them more liable to injuries of all kinds, particularly to the pressure and contusions incident to pregnancy and parturition. It is to such unfavorable conditions, doubtless, that the special frequency of inflammation, suppuration, and even gangrene, in these cysts is to be ascribed. The inflammation results in the formation of adhesions, and may subside; but should it assume a suppurative or gangrenous character, death follows from exhaustion unless spontaneous rupture at a favorable point, or operative interference, affords the necessary relief. If the cyst ruptures into the abdominal cavity, as it occasionally does, an acute diffuse peritonitis usually affects a lethal issue in a short time; fortunately, however, the preceding adhesive peritonitis generally averts such a result. Perforation occurs oftenest into the rectum or vagina, the most favorable routes for the escape of the purulent cyst-contents; though at times an outlet is provided through the abdominal wall. The appearance of hairs in the urine (pilimiction), together with pus and fat, announces that rupture into the bladder has taken place; but, from the inaccessibility of the fistulous opening into the cyst, the limited permeability of the urethra for masses of hair and other solid contents of the sac, as well as from the added danger of purulent cystitis, such an occurrence is to be classed among the least auspicious.

Fibroma and Cysto-fibroma of the Ovary.

While fibrous tumors of the ovary are by no means numerous, they are certainly not so rare as the literature of the subject would lead one to suppose; for it is doubtless true that under this head should have

been included many neoplasms of an alleged sarcomatous or myomatous nature, the cellular elements of which were identical with those of the normal ovarian stroma. It must be confessed, however, that the erroneous classification in such cases, as well as the widespread uncertainty concerning ovarian fibromata, which finds expression in the multiplicity of opinions advanced by the various writers on the subject, is merely what one would naturally expect under the circumstances, and admits of a simple explanation. In discussing the structural elements of the ovary we have already referred to the numerous spindle-shaped cells which enter so largely into the composition of the stroma, the other and chief component being a fine connective tissue. One group of distinguished and competent histologists, as we have seen, regard these cells as organic muscle-fibres, His even assuming that the whole of the stroma represented merely the hyperplastic *tunicæ mediæ* of the arteries, the adventitial layer of connective tissue being entirely wanting in the vessels of this organ. Others, again—and, as it seems to the writer, with more reason—affirm that the spindle-cells represent connective tissue in its immature form. True smooth muscular fibres do, however, enter the ovarian hilum from the broad ligament in connection with the blood-vessels, and perhaps others are contributed by the ovarian ligament, though Frey evidently deems them of too little importance to deserve mention (*Das Mikroscop*), while Fritsch scouts the idea that they could ever develop a myoma. Between these normal tissues of the ovary and the histological constituents of the fibromata a close resemblance frequently exists, though, from the changeable nature of the latter, the connection is not always so evident. The intercellular, or ground, substance of the tumors varies in amount, density, and arrangement, while the cells may be few or abundant. It is the presence of these very connective-tissue spindle-cells, however, which has frequently caused a true fibrous growth of the ovary to be regarded as a sarcoma, fibro-sarcoma, or cysto-sarcoma; and their microscopic resemblance to the muscular elements of the uterus often renders a differential diagnosis between ovarian and uterine fibroids a difficult, if not an impossible, task.

But do smooth muscular fibres ever occur in true ovarian fibromata? This question, which has evoked a most earnest discussion, has been answered in the affirmative by most pathologists, including Virchow, Birch-Hirschfeld, Klob, and Klebs, all agreeing that they are occasionally present in limited numbers, though Virchow intimates that, because of the difficulty with which small and slightly-developed or atrophic muscle-cells are distinguished from connective-tissue corpuscles, this scarcity may be only apparent.[1] Others, on the contrary, maintain with Leopold, Fritsch, and Spiegelberg, that the ovarian fibroma is

[1] *Vide* Virchow: *op. cit.*, Bd. iii. 1ste Hälfte, S. 223.

always pure, and that a myofibroma in that situation must spring from the broad ligament or uterus. It is certainly easy to understand how a subperitoneal uterine fibroid, developing outward between the folds of the broad ligament, may cause the absorption of the ovary through pressure or become incorporated with that gland, while its connection with the uterus is either preserved or severed. The final solution of this vexed question is hindered, however, by the fact that even in the dead body it may prove extremely difficult to decide positively whether a fibroid which occupies the site of an ovary originated in that organ or in the uterus.

But, to return to the occurrence of these tumors, Tait makes the following remarkable statement: "Growth of the fibrous stroma of the ovary, so as to form a large abdominal tumor requiring removal, has not yet been described, so far as I have been able to discover;" and, in a comparatively recent personal interview with this distinguished author, the writer was confidently referred to Greig Smith's then forthcoming work on "Abdominal Surgery," for additional testimony to the same effect. Instead of corroborating Tait's assertion, however, Smith refutes it directly, by citing as a personal experience the successful removal of a "solid ovarian tumor as large as a child's head, in which repeated examinations by competent histologists failed to show any other histological element than pure fibrous tissue."[1]

Olshausen mentions the finding of six fibromata in 293 of his cases of ovarian disease; Leopold tabulates 59 cases;[2] while Coe has not only convinced himself of the genuineness of reported fibrous tumors in more than twenty instances, but claims that he has occasion to examine two or three undoubted specimens in the course of each year.[3] These tumors are of slow growth, and usually affect a single ovary, though Leopold asserts that in three out of every sixteen cases the disease is bilateral. As for the age of the victims, it has been found that young women are most frequently thus afflicted. In point of size the tumors vary between wide limits. Thomas mentions the removal of a genuine fibroma which equalled the head of the largest man in its dimensions; Simpson found one weighing fifty-six pounds; while Spiegelberg describes an enormous fibroid sixty-six pounds in weight, the patient's abdomen being so distended as to measure forty-one inches in length and sixty inches in its greatest circumference.[4] These are exceptional cases, however, and almost always fibro-cysts:

[1] J. Greig Smith: *op. cit.*, p. 130.

[2] *Vide* Leopold: "Die solid. Geschev. d. Ovar," *Arch. f. Gyn.*, Bd. vi. H. 2, und Bd. xiii. S. 155.

[3] The reader is advised to consult Coe's able monograph in the *Amer. Journ. of Obstet.*, vol. xv. p. 561.

[4] Consult Spiegelberg: *Monatsschr. f. Geb.*, Bd. xxviii. S. 415.

the great majority of fibrous ovarian tumors are much smaller, resembling an egg or an orange in bulk.

A long and slender pedicle, representing the mesovarium, usually connects these growths with the posterior surface of the broad ligament. Sometimes, however, the attachment is short and broad, and, in exceptional instances, the tumor may invade the intra-ligamentous connective tissue and become sessile.

While the whole ovary may have disappeared, it is more frequently the case that a portion only of the gland is the seat of the neoplasm, and usually it is the end farthest from the uterus which is thus affected. Though the balance of the ovary is still recognizable, it very often exhibits all the changes produced by chronic ovaritis. The stroma may be indurated and hyperplastic, the follicles transformed into corpora fibrosa.

FIG. 344.

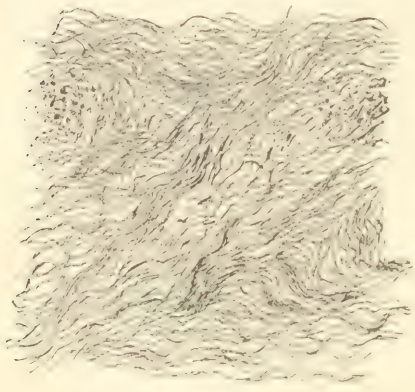
A Fibroma of the Ovary.[1]

These ovarian fibromata form roundish masses having smooth, nodular, or lobulated surfaces; and, as they present a shining appearance, their resemblance to the subserous fibroids of the uterus is quite marked. Unlike the latter, however, they cannot be shelled out of the surrounding tissues, being more or less intimately incorporated with the rest of the gland. The tumors may be very dense and hard, or, in consequence of various retrogressive changes, they may soften and finally fluctuate distinctly when manipulated. Save in the absence or great scarcity of muscle-fibres, the microscopical appearances presented by sections of the ovarian fibromata correspond almost perfectly to those observed in the case of uterine fibroids. The smaller tumors

[1] This and the following drawing, for which the writer is indebted to his friend Dr. H. A. Matzinger, illustrate the gross and minute appearances presented by a solid tumor, of homogeneous fibrous structure and weighing seven pounds, which was removed by Dr. M. D. Mann in 1886. (See *Amer. Journ. of Obstet.*, vol. xx. p. 451.)

are made up of dense fasciculi of fibrous tissue, running in all directions; so that a cut surface presents fibres and cells divided in a longitudinal, oblique, and transverse direction. Transparent gray or yellowish areas then alternate with others of a whitish and more opaque appearance, the whole forming a medley which is familiar to the pathologist. In the larger growths some smooth muscular fibres may be found, and to such the name "myo-fibromata" would be applicable. Cysts of various sizes may also be present, produced by the softening and liquefaction of the tissues, and in other ways which we shall presently describe (cysto-fibromata of fibro-cysts).

FIG. 345.



A Section of an Ovarian Fibroma.

Of the *etiology* of these growths very little is known. Some of the smaller tumors, however, are undoubtedly the result of inflammation, representing simply stroma of the organ in a condition of excessive hyperplasia, either localized or diffuse.

As for their *histogenesis*, it has repeatedly been shown that fibromata, either pedunculer or sessile, may arise from the tunica albuginea. A few cases are also on record in each of which the tumor originated in a corpus luteum; two such have been reported by Rokitansky, one by Klob, and one by Jenks.[1] The results of Patenko's studies are interesting in this connection.[2]

This observer declares that the enormous ovarian fibroids which have been described by various writers must have arisen elsewhere than in the ovaries, and certainly not in the *corpora lutea*, since the absence of vessels in true ovarian fibromata precludes their attaining any great size. The walls of the corpora lutea and other immature follicles, whether ruptured or not, become infiltrated with cells and converted into granulation tissue, and from this is formed dense new inflammatory tissue which contains no blood-vessels. Such corpora fibrosa may be either solid or hollow, according to the previous condition of the follicles from which they have developed. Surrounding the corpora fibrosa, however, are blood-vessels which undergo the same changes as the follicles. These degenerated vessels may be single or in groups, and in the latter case they form masses of sclerotic tissue which may unite with the sclerosed follicles and form true fibrous

[1] *Amer. Journ. of Obstet.*, vol. vi. p. 107.

[2] *Vide* Patenko, "Ueber die Entwicklung der Corpora fibrosa in Ovarien," *Virch. Archiv*, Bd. 84.

tumors, the size of which varies according to the extent of the disease. But, inasmuch as the corpora fibrosa undergo no active growth, the resulting tumor can in no instance become larger than when all its follicles and blood-vessels are thus metamorphosed and aggregated into one mass—that is, not larger than a goose-egg. There is no doubt, however, that fibromata do develop from the ovarian stroma quite independent of any preceding inflammation.

Various *secondary changes* may occur in these tumors, such as the formation of cysts, mucoid, fatty, and calcareous degeneration,[1] torsion of the pedicle, interstitial hemorrhage, suppuration and gangrene, the formation of cartilage or bone, adhesions to surrounding structures, conversion into spindle-celled sarcoma, etc. Of these the most important is the formation of cysts of various sizes, the smallest of which are to be detected only with the aid of the microscope. A solid tumor in which these cavities form is called a "cysto-fibroma" or "fibro-cyst," though, on the principle that *a potiori fit denominatio*, the latter term would be more fittingly applied to those tumors in which the cysts formed the more prominent feature. Such cysts may be due to localized degenerative softening and liquefaction of the tumor when their contents consist of fatty débris in a more or less fluid condition. Again, the cavities represent dropsical follicles of De Graaf, and contain fluid which is either limpid, cloudy, or tinged with blood. Finally, from some unknown cause the lymph-spaces in the connective tissue of the tumor may become distended with a clear serous fluid, which coagulates on being exposed to the air. The resulting cysts have walls of fibrous tissue representing ovarian stroma, condensed by the intra-cystic pressure. In the early stages of their formation such cystic lymph-channels probably constitute the so-called "gelatinous patches" or "geodes" described by various writers. Such lymphatic cysts may be so numerous and so large as almost to occasion fluctuation in the tumor (*fibroma lymphangiectodes*), while the resulting fibro-cysts attain enormous dimensions. A cancerous condition of an ovarian fibroma is also produced at times by the enormous dilatation of its blood-vessels, which takes place in consequence of torsion of pedicle and other causes.

Torsion of the pedicle is not rare, since most of the ovarian fibromata are small, firm, and provided with long pedicles—conditions which favor its occurrence. As in the cystomata, this condition leads to hemorrhage, inflammation, suppuration, and even gangrene. Cases of suppuration due to torsion, or to direct injuries inflicted upon the tumor during parturition, etc., have been observed by Rokitansky, Kiwisch, Safford, Lee, and others.

Cartilage or bone may form as pathological metaplasias of the

[1] *Vide* article by Spencer Wells: *Trans. Lond. Path. Soc.*, vol. x. p. 199.

fibrous tissue. Thus Waldeyer describes an ovarian fibroid which had been completely converted into an osteoid structure;[1] and Kleinwächter performed a laparotomy for the removal of a bony tumor a small portion of which was still fibrous.[2] Cartilaginous growths in an ovarian fibroid have been reported by Schroeder. Inflammatory adhesions may form between the fibroma and the adjacent serous surfaces, both visceral and parietal, but they are rare in tumors of small size.

Ascites is a frequent and early complication of the ovarian fibroma, the fluid at times being very abundant. Little is known, however, of the causes to which this condition is to be ascribed.

Cancer of the Ovary.

The varieties of cancer which attack the ovary are the encephaloid or medullary, the scirrhous, and the alveolar or colloid; though the first of these is by far the most frequent in its occurrence. Either one or both ovaries may be involved, statistics showing the disease to be bilateral in about 50 per cent. of the cases (Leopold). As to the order of its appearance, ovarian carcinoma is much more frequently primary than secondary.

A word concerning the proper application of these final terms. When cancer appears in some organ, as the uterus, and subsequently in the ovary, the ovarian disease is said to be secondary; while, should the reverse order of sequence obtain, we speak of the cancer as being primary in the ovary. In neither case, however, does the proper use of these epithets imply a previously normal condition of the ovary; in fact, primary cancer affects an ovary already diseased much more frequently than it does the healthy organ.

Thus, a proliferating cystoma of the ovary not infrequently undergoes carcinomatous degeneration. In such a case the malignant disease makes its appearance in the cyst-wall as nodules or as more diffused swellings which in the beginning may be entirely overlooked. Later the encephaloid or medullary growth may invade the interior of the cyst, completely filling it in some cases. Such a tumor would be termed a *cystoma carcinomatosum*. Should the cystic element be less pronounced, the carcinoma appearing more as a luxuriant atypical growth of the glandular structures, the name *glandular* or *adenoid* cancer would be appropriate. That the proliferation of the epithelial elements of the ovary which results in the formation of the usually benign cystomata is not widely separated from malignancy is also evidenced by the fact that after the ablation of seemingly pure cystomata patients may soon die of cancer of the cicatrix, peritoneum, or of other organs.

[1] *Vide* Waldeyer: *Arch. f. Gyn.*, Bd. ii. S. 440.
[2] Kleinwächter: *Arch. f. Gyn.*, Bd. iv. S. 171.

Such clinical experiences have fallen to the lot of Klebs, Tait, Mann, and most other operators of prominence.

The malignant tendencies of the ovarian papillomata, whether superficial or intra-cystic, are now well known, as we have seen. These growths, which at first offer no anatomical evidence of malignancy, often assume a cancerous structure, spread over the surface, and invade the substance of surrounding organs, producing ascites and early death. This constitutes the so-called *papillary* cancer. Dermoid cysts may likewise undergo cancerous degeneration. Of 102 ovarian tumors removed by Schroeder, one dermoid, two papillary, and four glandular cystomata were found to be affected with carcinoma.

Colloid cancer, according to Waldeyer, is allied both to the cystoma and carcinoma, representing an intermediate or transitional stage. The ovary may be only slightly enlarged or it may exceed a man's head in its dimensions. On section it is found to contain numerous small cavities filled with colloid material in which epithelial cells may be found. Nests of epithelial cells are found in the stroma; and the whole growth resembles a parvilocular cystoma, with which, doubtless, it has frequently been confounded. It is probable that the alveolar cancer simply represents a medullary carcinoma or a scirrhus which has undergone mucoid or colloid change. This view is certainly supported by the observations of Rokitansky, who found that medullary cancer of the ovaries was usually associated with the colloid form.

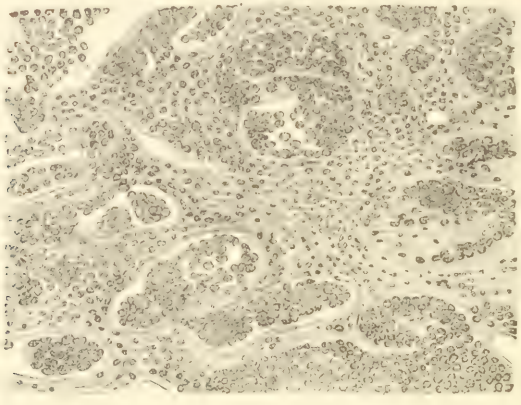
An idea of the frequency of ovarian cancer may be gathered from the following: Peaslee observed the disease in its primary form but four times in over 200 autopsies and ovariotomies, and two of these cases might be regarded as uncertain; Olshausen found five cancers among 293 ovarian tumors which he had removed; Billroth observed the same number in the course of 86 ovariotomies; while Hildebrandt's record was seven cancers among 37 tumors. When malignant disease of other viscera is present it is not unusual to find the ovaries involved secondarily.

As for its *anatomy*, a cancerous ovary may be but slightly enlarged or it may reach the size of an adult's head. Its surface is generally nodular and of a whitish color; while the growth ranges from a somewhat firm to a soft brain-like consistence. In its general outline the tumor at first preserves the oval shape of the normal gland, though its later tendency is to assume a round form. The invasion of the ovary by the proliferating cancerous epithelium of the follicles, and the accompanying small-celled infiltration, may occur in two ways. In the first place, it may be diffuse, involving the stroma of the whole organ, or, again, and less frequently, one or more cancerous foci form in an otherwise healthy gland and increase in size, giving a nodular appearance to the tumor. That the disease is progressive, however, and

does not destroy all the follicles simultaneously, is shown by the fact that ovulation and conception have ensued in patients with bilateral ovarian cancer.

Because of the smaller size of the ovarian fibromata and the fact that they are usually attended with ascites, adhesions are not so frequent as in the case of the proliferating cystomata; with the progress

FIG. 346



Encephaloid of the Ovary (Tait).

of the disease, however, they are prone to inflame and undergo other secondary changes which alter their general appearance. Membranous deposits then form on the surface of the tumor; it becomes adherent to the surrounding parts; the disease extends to the uterus, opposite ovary, intestines, and deep pelvic structures, till, finally, in the advanced stages of the disease the whole pelvis is filled with an irregular cancerous mass. Early in the disease the mesovarium forms the pedicle and the tumor is freely movable; soon, however, its attachment becomes broad and short or very thick. Finally, the pedicle may be entirely wanting.

Inasmuch as ovarian cancers correspond to those in other localities, so far as their minute anatomy is concerned, the subject requires no further consideration at present.

The fact that primary cancer of the ovaries is comparatively frequent between the ages of fifteen and thirty has an important bearing upon the *etiology* of the disease, suggesting as it does the potency of puberty in its early and most active period as a predisposing cause. Pregnancy and parturition, even when frequent, are seemingly without any adverse influence; and, though Olshausen, basing the view upon one of his own cases, suggests sexual excess as an etiological factor, this has not yet been proved. According to Tait, the occurrence of ovarian cancer may be traced to the death or absence of the ovules.

When this takes place the follicular epithelium reverts to the fœtal type of growth, its luxuriant proliferation resulting in the production of cancer-cells instead of the normal cylindrical variety. Should cancer occur primarily in other organs, its secondary appearance in the ovary could, of course, be easily explained.

Of *secondary changes* in ovarian cancers, the most important is fatty degeneration, which is usually most marked in the encephaloid variety. This results in the softening and disintegration of portions of the neoplasm, and ultimately in the formation of cysts, the cavities being bounded by ragged walls of carcinomatous tissue. Thus a cysto-carcinoma is produced, which differs, as we have seen, from a carcinomatous cystoma, since in the former case a cancer is complicated with cystic degeneration, in the latter this order is reversed. Mucoid and colloid degeneration, hemorrhage, and pigmentation may also occur in these tumors. Cases of psammomatous ovarian carcinoma have been reported by Flaischlen and Olshausen in which *corpora arenacea* were present in large numbers. These concretions, which formed in the epithelial cells, consisted of an organic base arranged in concentric layers, about which was deposited the carbonate of lime.

Metastatic malignant growths may make their appearance at almost any point of the body in cases of primary cancerous degeneration of the ovary; though the secondary deposits most frequently occur in the peritoneum, retro-peritoneal lymphatics, stomach, intestines, and liver.

Sarcoma of the Ovary.

This form of tumor finds its physiological prototype in the connective tissue, but in its immature or embryonic state, before final differentiation ensues, rather than in any of the forms which it assumes when fully developed. Thus, a collection of round cells which are precisely similar to those found in the embryonic mesoblast may retain its primitive character, the cells proliferating, but remaining round or oval in shape (round-celled sarcoma); later, all or only a portion of the cells may go a step farther in the scale of development and become transformed into spindles (spindle- or mixed-celled sarcoma respectively); some of the spindles may fibrillate and attain their full physiological development (fibro-sarcoma); finally, instead of fibrous tissue, others of the connective group, such as mucous or cartilaginous, may develop from a portion of the cells (myxo- or chondro-sarcoma). On the other hand, a typical histoid tumor, such as a fibroma, may secondarily become a sarcoma or fibro-sarcoma respectively, provided the cells throughout the growth or in a part only proliferate without any further development of formed tissue.

Sarcoma of the ovary, though more frequent in its occurrence than

carcinoma, is still a comparatively rare tumor, Schroeder finding but 10 such among 600 ovarian growths; while Olshausen reports that 12 out of 293 of his cases were of this nature. The spindle-celled variety is most common; and when one considers that the ovarian stroma is largely composed of young fusiform connective-tissue cells, Leopold's belief that the structure of the ovarian stroma favors the growth of sarcomata seems very plausible. The same view is also held by Klebs, who attributes the formation of these tumors to the hyperplastic growth of the ovarian stroma.

The pure round-celled or medullary variety of sarcoma also attacks this gland, though very rarely. Such a condition has, however, been reported by Beigel and Albert. Besides this and the spindle-celled sarcoma are found mixed-celled growths composed of both forms in varying proportions. Myxomatous tissue is quite frequently found in combination with sarcoma, the resulting growth being a myxo-sarcoma. These malignant ovarian growths are much more frequently bilateral than the proliferating cystomata, and when so they are generally of moderate size. In the majority of instances, however, the solid tumors range from a child's fist to a man's head in bulk; though cysto-sarcomata may even exceed in their dimensions the uterus at term. A case of the latter character is reported by Olshausen. After the death of the patient this author found a tumor weighing twenty-five pounds, notwithstanding the fact that twenty-two pounds of fluid had been drawn from its cystic cavities only shortly before the fatal termination of the case. Clemens[1] describes as a medullary sarcoma an immense tumor weighing eighty pounds, the sarcomatous nature of which, however, is doubtful. The growth had been present ten years, and had increased rapidly in size at the close.

Very little is known concerning the *ætiology* of these tumors, though they seem to prevail most extensively when the formative and functional activities of the gland are greatest. Even the newly-born may be afflicted with sarcomata of considerable size (Klebs), while a large majority of the tumors occur during childhood and the period of greatest sexual activity.

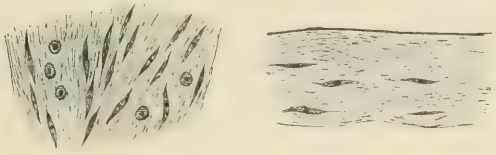
The *gross appearance* of the ovarian sarcomata, particularly the fibro-sarcoma, resembles in many respects that presented by the fibroma and other solid tumors of the ovary. They are not so irregular in their shape as are the proliferating cystomata, being usually of oval or roundish contour; their surface is smooth, as a rule, and of a whitish or pinkish-white color, while in consistence they are generally, though not always, quite firm, the round-celled variety being soft and brain-like. Cysts of small size and projecting but slightly above the surface of the tumor are frequently present. On section the fibro-sarcoma usually

[1] *Deutsche Klinik*, 1873, No. 3.

presents a translucent and somewhat fibrillated appearance, while the more immature forms resemble raw flesh to a greater or less extent.

The *microscopical characteristics* of these tumors are too well known to demand consideration here. The accompanying cut (Fig. 347) rep-

FIG. 347.



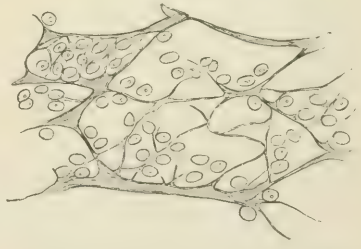
Spindle-celled Sarcoma of the Ovary (Doran).

resents the deeper, more cellular portion of a small spindle-celled sarcoma, as well as its more fibrous superficial structure. The large and numerous blood-vessels, of irregular distribution, usually form a prominent feature, and may lend a cavernous appearance to the tumor. Their walls are frequently formed by the cells of the neoplasm themselves—a fact which accounts for the early and rapid dissemination of this class of growths.

Occasionally that rare form of round-celled sarcoma first described by Billroth and known as the alveolar sarcoma is observed in the ovary. This tumor is easily confounded with the cancers because of its large epithelioid cells arranged in loculi. The fact that fibrils of connective tissue pass from the alveolar walls between the individual cells, however, serves to distinguish the sarcomatous nature of the growth.

When the epithelial as well as the connective-tissue cells of the ovary proliferate, the malignant mixed tumor is formed which Virchow terms sarcoma carcinomatosum. Spiegelberg[1] has also described a myxosarcoma carcinomatodes hæmorrhagicum in which sarcomatous degeneration of a mucous matrix coupled with hemorrhage had occurred. The presence of alveoli containing large fatty cells and possessing vascular walls of connective tissue supplied the carcinomatous element. In case the glandular structures in a sarcomatous ovary develop and become prominent, an adeno-sarcoma results.

FIG. 348.



Alveolar Sarcoma of the Ovary (Doran).

Among the *secondary changes* which take place in the sarcomata the most important is fatty degeneration, resulting as it does in the formation of softening-cysts without proper walls and containing fatty contents of a cloudy appearance. The blood-vessels in the vicinity of

[1] *Monatssch. f. Geb.*, Bd. xxx. S. 380.

these fatty foci may become thrombosed—an accident resulting, perhaps, in embolism, hemorrhagic infarctions, necrobiosis, and even rupture followed by peritonitis. Calcification may also take place; and, as we have seen, portions of the tumor may come to resemble various types of fully-developed connective tissue.

Inasmuch as the pedicle admits of torsion in some cases, the supervention of this accident may account for the occurrence of fatty degeneration, hemorrhage, inflammation, gangrene, and other changes of a retrogressive character. The small size of the tumors and the early appearance of ascites account for the comparative rarity of adhesions.

Other Forms of Ovarian Tumors.

1. Leio-myoma.—Tumors composed of pure, smooth muscular tissue are extremely rare; indeed, Virchow asserts that such an ovarian neoplasm has been observed by Sangalli alone. The latter discovered a soft vascular growth of the ovary as large as a small hen's egg and composed principally of muscle-fibres, between which there appeared roundish cells.[1] "As the ovarian stroma contains no muscular fibres," says Fritsch,[2] "myomata could not possibly be observed;" but, as we have seen, this extreme statement is certainly and amply refuted by the investigations of many leading histologists of the present day. It is almost certain that the so-called ovarian myomata of the different authors were in reality fibromata, either pure or containing muscle-fibres in sufficient numbers to justify the name myo-fibromata. Thus, for example, the myoma of the ovary which is figured and described by Doran[3] should rather have been interpreted as a fibroma, since, in describing its minute structure as bearing "the very closest resemblance to sections from uterine 'fibroids,'" that author convicts himself of error, in the writer's opinion.

2. Chondroma.—The rarity of this form of ovarian tumor is instanced by the fact that but three cases are described as such in modern literature. In one of the two which came under the observation of Kiwisch[4] both ovaries were surrounded by a large number of thick cartilaginous plates and nodular masses, both large and small, in consequence of which the organs were enlarged to the size of hens' eggs and presented a tuberous appearance. In Kiwisch's second case the whole right ovary formed a tumor as large as a fist and was covered with false membranes. Numerous firm cartilaginous nodules appeared externally, which when incised were found to soften as the centre was neared, the tissue there presenting the character of hyaline cartilage of diminishing density. Of these tumors the first cannot be regarded

[1] Sangalli (*Storia dei tumori*, ii. p. 220), quoted by Virchow, *op. cit.*, S. 223.
[2] *Op. cit.* [3] *Op. cit.*, p. 97. [4] *Diseases of the Ovaries*, 1860.

as enchondromata, since Virchow and others speak of them as simple cartilaginous thickenings of the tunicæ albugineæ. Scanzoni, who afterward saw the tumor removed from Kiwisch's second case, regarded it as a fibroma in the connective tissue of which new cartilage had formed. Finally, in January, 1882, Schroeder removed a solid tumor of the left ovary from a young woman nineteen years of age who soon after died from the effects of secondary cancer. The growth was about nine inches long, five inches broad, and nearly four inches thick, retained to some extent the contour of the normal ovary, as is generally the case with solid tumors of the ovary, and weighed about four pounds. Upon examination it proved to be a fibroma which had undergone myxomatous and chondromatous metamorphoses. Reiss,[1] who subsequently submitted the tumor to a most thorough examination, declares that it forms the second known case of true ovarian chondroma. Although the fibrous tissue still exceeded the cartilaginous in amount, Reiss feels that his conclusion is justifiable because of the comparative importance of the latter constituent (*a potiori fit denominatio*).

[1] "Ueber Enchondroma Ovarii," *Inaug. Dissert.*, Berlin, 1882.

THE CLINICAL HISTORY AND DIAGNOSIS OF PELVIC TUMORS OTHER THAN UTERINE AND TUBAL.

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Ovarian Cystomata.

Clinical History.—*Rate of Growth and Duration.*—We may conveniently divide the history of an ovarian cyst into three stages. In the first stage the tumor is confined to the cavity of the true pelvis; in the second, by a gradual growth, it reaches above the pelvis and as far as the umbilicus; while the third stage is reached when it passes the level of the navel and rises up into the epigastric region. The length of time consumed in each stage varies greatly in different cases.

As these tumors are very seldom recognized during the first stage, we have few data on which to base a computation of their rate of growth. Peaslee thought from a few cases observed by him that the average length of time between the inception of a growth and the discovery of its presence by the patient varied from two to two and a half years. The powers of observation, however, differ so widely in different individuals that the time of discovery varies greatly. The writer has seen a patient entirely unconscious of a fifteen-pound tumor before her attention was called to it by the attending physician.

The rate of growth generally increases almost in arithmetical ratio, so that small tumors grow slowly. If, then, we place the first stage as lasting from a year to a year and a half, we will be giving a liberal estimate.

In the second stage the tumor quite usually attracts the patient's attention—not as a rule, however, before it is several inches above the pubes. While the average length of the second and third stages can be found, there are many variations from this average. In some instances the tumors grow rapidly for a while, and then cease, or decrease their rate of growth so as to appear to stand still. In other cases, after a slow growth for some time, a sudden rapid increase will

take place and bring the patient to the end of the third stage in a surprisingly short time.

Attempts have been made to determine the duration of the disease, when left to itself, from the first discovery of the tumor, generally during the early part of the second stage, to the end. The statistics of T. S. Lee comprise 131 cases from discovery till death, while Bird collected 50 cases. Of these, nearly two-thirds died within the first three years, and but a very few lasted beyond the tenth year. Lee states that the usual duration of the disease from discovery is one or two years. By tapping and other palliative treatment life is sometimes greatly prolonged, and even without this the patient sometimes lasts for years. Lee saw 2 cases of twenty-five years' duration, and 1 of thirty years'; Druitt had 1 of thirty years'; Frank, 1 of seventy-five years'; and Harris, 1 of fifty years'. Of some of them the diagnosis might be questioned, as the distinction between ovarian and parovarian cysts is of comparatively recent date, and, as is well known, the parovarian cysts usually grow very slowly and last longer than the ovarian. But Thomas has removed an ovarian cyst which had lasted twenty-three years, another twelve and a half years, another ten, and another nine years. I have seen one case of twenty-five years' duration which presented all the evidences of ovarian cyst, and have removed one which had lasted fifteen years, and three which had lasted eight years each, without tapping.

While many tumors grow thus slowly, others increase with remarkable rapidity. The writer has seen double ovarian cysts, with colloid contents, which weighed together twenty pounds, make more than one half of their growth in two weeks. Undoubtedly, in many of the recorded cases of rapid growth the increase is due to hemorrhage into the sac, but then the fluid will be largely mixed with blood. Among the older writers some of the cases can be explained as cases of hydramnios or pelvic inflammation and effusion; but others in recent times have noted still more rapid growths. Olshausen records a case of a cyst with colloid contents which increased in circumference from 92 to 100 cm. in ten days, with marked increase of the general symptoms. Tait reports a case where he removed a tumor of "great size" which had grown in four months. Still, although we may find exceptional cases of very slow and very rapid growth, we may safely say with Olshausen that in cases of proliferating cysts 60 to 70 per cent. die within three years from the first symptoms, and 10 per cent. more in the second year. Great harm may result from considering the slow-growing cysts as a proper basis for prognosis, and acting thereon. Rather should we consider them as exceptions, and look on the cases of early death as the rule. Unquestionably, tumors approaching the monocystic type grow more slowly than the polycysts.

Age.—No age is exempt from the invasion of an ovarian cyst. They have been noted as congenital.[1] Busch (Bonn) operated on a two-year-old child. Dr. J. F. Jenkins referred to a case where peritonitis followed the bursting of a cyst at three years and four months, while Thomas saw one at three years and five months, and Schwartz did a successful ovariotomy on a child four years of age. Other cases[2] have been reported as occurring at almost any year of life up to extreme old age.

The youngest with which I have met was sixteen, and the oldest seventy-seven years of age, the tumor having been observed for only eighteen months: both were cured by operation. Schroeder[3] operated successfully on patients aged seventy-nine and eighty respectively, and Homans[4] was successful on a patient eighty-two years and four months old, the tumor having been noticed for about two years. A number of other cases seventy years old and upward have been observed.

Symptoms.—In the majority of instances ovarian cysts produce no pain. Even when very large there is nothing more than the weight and general discomfort due to size. But, exceptionally, there is more or less pain. This may be referred to the back, sides, hips, and pelvis, or directly to some spot in front over the tumor. This pain often comes in severe acute attacks localized over a small extent of the tumor. Such attacks may be intermittent, lasting from a day to several weeks. The cause of these attacks of pain I have been unable to determine. I have several times looked carefully after opening the abdomen at the painful spot, but have been unable to find any lesion either inflammatory or congestive. This is important from a prognostic point of view, as such attacks do not mean adhesions.

In some instances pain has been complained of in the bladder and rectum. Some patients will be unable to lie on one side, though perfectly comfortable when on the other. When the abdominal walls are tense and the tumor increasing, a bursting feeling is complained of. Sometimes, even when the tumor is quite small, gastric symptoms—indigestion, irritable stomach, even nausea and vomiting, with dry, glazed, red tongue—show themselves, and, joined with them, bloating and variable size; these symptoms are probably reflex and not due to pressure. As the tumor grows the symptoms become more marked, and we have added the direct results of crowding and pressure. The bowels, especially the large intestines, are interfered with; constipation is common, and occasionally complete obstruction is met with. The bladder is also pressed upon, and there is frequent desire to urinate;

[1] T. G. Thomas: *Amer. Journ. Obst.*, vol. xiii. p. 118.
[2] Chenoweth: *Amer. Journ. Obst.*, vol. xv. p. 625.
[3] *Krankh. der Weib. Geschl.*, 1887, p. 420.
[4] *Boston Med. and Surg. Journ.*, May 3, 1888.

rarely retention is observed. The bladder symptoms seem to come less often from direct pressure than from an abnormal state of the urine induced by the disturbance of the digestive processes. As proof of this bladder symptoms are not the rule, and are sometimes absent with both large and small tumors. With large tumors the absence of symptoms can be explained by the rising of the tumor from the pelvis, so that there is room for the bladder under it. The secretion of urine is sometimes hindered, and the kidneys may be nearly flattened by direct pressure; their situation, however, usually protects them.

As a result of pressure the lower extremities may become œdematous. Emaciation is very common, especially in the third stage, and is much more marked in the upper half of the body. As a result of this, and perhaps aided by the mental anxiety induced by the presence of the tumor, the face assumes a peculiar drawn, anxious expression which is quite characteristic of the disease. It is called *facies ovariana*, and is thus described by Sir Spencer Wells: "The emaciation, the prominent or almost uncovered muscles and bones, the expression of anxiety and suffering, the furrowed forehead, the sunken eyes, the open, sharply-defined nostrils, the long compressed lips, the depressed angles of the mouth, and the deep wrinkles curving around these angles, form together a face which is strikingly characteristic."

The uterus is generally displaced and its functions are more or less interfered with. That the latter is not always the case is proved by the coexistence of pregnancy, many instances of which have been observed. The uterus is commonly pushed downward and backward, but often it lies in front of the tumor, and may even be drawn up to such an extent as to be easily felt between the abdomen and the cyst, and be more or less completely out of reach through the vagina. Menstruation generally goes on, but its regularity is often interfered with, and both the amount and frequency may be increased or diminished.

In women who have passed the menopause there is sometimes a bloody discharge from the uterus, irregular or nearly continuous, which may give rise to the suspicion of malignant disease of that organ. The condition of the uterus should always be carefully investigated before an operation, as it may at that time be possible to permanently rectify a displacement by an appropriate procedure, or by removing the other ovary to cause a shrinkage of a heavy, enlarged, and metrorrhagic uterus, which, if not cured, may after the ovariotomy still leave the patient more or less of an invalid.

The temperature during the early stages of the disease is seldom affected. When the tumor begins to fully distend the abdomen we sometimes meet with a little rise, in the evening 100°, while the morning register is normal or even subnormal. This is not due to any inflammatory action; later the temperature-changes are more marked,

and as the end approaches it is not unusual to find a considerable rise—101° or 102°. Chilly sensations, not amounting to a real chill, are then not uncommon. As the tumor enlarges pressure on surrounding organs becomes more and more injurious and painful. The lungs act at a great disadvantage; dyspnœa and orthopnœa become marked. The patient is unable to sleep; the digestive organs refuse to work; the stomach rejects all food; emaciation becomes extreme; the lower extremities are greatly swollen; the temperature rises; the heart becomes more feeble and the pulse more rapid; and, finally, the patient sinks and dies from exhaustion. It will thus be seen that until near the end there is no clearly-marked clinical picture which is characteristic of ovarian cystic disease. While certain symptoms are often met with, there are so many exceptions that little expectation can be had of the occurrence of a particular one in any given case.

Termination.—As we have already seen, what might be called the normal termination of an ovarian cyst is death from exhaustion through interference with the digestive and respiratory organs. Death may come in other ways—from certain accidents to the cyst itself, and also from complications depending more or less on the presence of the tumor. Before considering these accidents and complications the question of spontaneous cure presents itself for consideration.

The *spontaneous cure* of an ovarian cyst, to one who has seen and handled a tumor after its removal, may seem an impossibility, and yet many cases have been reported. That the cyst-wall should under any circumstances be absorbed seems hardly possible, but if it be emptied of its contents and secretion be stopped the mere presence of the empty, shrunken sac in the abdominal cavity can do no harm and does not count against a cure. The methods by which it is asserted that a cure may take place are—absorption, rupture, inflammation and perforation, ossification, and torsion of the pedicle.

Absorption.—That ovarian cyst can be spontaneously absorbed is certainly very doubtful. The difficulty of accepting any statement of this kind arises from the doubt as to the diagnosis. Given a tumor which bears all the clinical marks of an ovarian cyst, if that cyst disappears spontaneously without rupture, can we believe that it was an ovarian cyst? Most persons would certainly be incredulous.

Ossification of a cyst may occur. Winckel reports a specimen as existing in a Dresden museum. The tumor, as large as a man's head, is completely ossified and contains all the elements of true bone. Such a result is, however, unique, and perhaps could hardly be called a cure. As the other methods of cure all result from certain accidents to the cyst, they will be considered under this heading.

Accidental Changes in Cystomata.[1]

'Rupture of the Cyst.—The symptoms of rupture depend on the nature of the tear and the character of the cyst and its contents. In a cyst with bland watery fluid the only symptom may be a subjective feeling of something giving away, followed by a rapid diminution in the size of the cyst. The kidneys and bowels may rapidly eliminate the fluid, and little or no inconvenience be felt. If the cyst does not refill, a cure results, but this is very rare. In some cases there is more or less shock, followed by a slight increase in the temperature and pulse-rate, which after lasting a few days entirely subsides. If the cyst-opening is small, it now generally closes and the sac refills; rupture may again follow, and the process be repeated a number of times. If the opening fails to close, the patient may suffer from a chronic ascites, secretion from the cyst-wall going constantly on, aided by the inflamed peritoneum. In this case a diagnosis is difficult and the disease is apt to be considered malignant. The result is generally exhaustion and death, though an operation may result in a cure.

If colloid material exist in the sac, its eruption into the peritoneal cavity has a very different effect. This colloid matter is generally very irritating, sometimes actually poisonous, as in a case met with by Dr. J. P. White. Then its presence sets up peritonitis, which may be violent and acute or subacute, passing into the chronic form. Such a result I have seen follow simply tapping with a hypodermic needle a very tense colloid cyst: an operation with careful washing out of the abdomen cured the patient, but only after a severe attack of acute non-suppurative peritonitis, which began before the abdomen was opened.

In one case in an exploratory operation I found a multilocular cyst firmly adherent to the pelvis. In one of the smaller cysts there was an opening the size of a lead-pencil, with round, smooth, sharply-cut edges. From this exuded a very small amount of an exceedingly thick colloid material. This was just enough to keep up a constant irritation and exudation from the peritoneum, so that the abdomen was filled with fluid. Owing to the extreme feebleness of the patient and the very firm adhesions, the operation was abandoned, after first sewing up the hole. The patient died of exhaustion a few months later, though the tumor was quite small.

When a cyst is ruptured by the presence of papillomatous growths from within the result is apt to be bad. The papilloma crowds into the opening, and when in contact with the peritoneum, as claimed by Doran, is capable of causing a malignant infection. The rupture into the abdomen of a gangrenous and suppurating cyst must necessarily be quickly fatal. Fortunately, these cysts do not always rupture in this

[1] See chapter on Pathology, same title.

way. The opening may be into one of the hollow viscera, as stomach, intestines, or bladder. The rectum is a favorite seat of this accident. Of course adhesion must first occur. A cure might thus result, but death from septicæmia is more general.

I have once seen a suppurating cyst rupture through the abdominal walls through the scar of an old puncture. When seen it had been discharging in this way for a long time, the patient suffering all the time from sepsis. Cysts which are not suppurating may discharge in a similar manner; that is, through either the intestines, bladder, or abdominal wall. Instances are on record where such discharges have lasted for years; but, in general, if suppuration has not occurred, it is apt to follow the admission of air or gas from an intestine.

Hemorrhage from rupture is usually slight, as the thinned cyst-walls are apt to contain few vessels of any importance to bleed. But if the inside of the cyst be very vascular, the diminution of pressure within the cyst by relieving the support of the vessel-walls may result in their rupture and a more or less violent hemorrhage. This may be sufficient to very rapidly reduce the patient to a condition of extreme anæmia, and should always be borne in mind as a possibility after rupture of the sac.

Rupture into a Fallopian tube has been observed. This occurs in the so-called tubo-ovarian cysts. I have seen the tube as large as the small intestine. Should rupture occur into such a tube perfect drainage would be established. Air would hardly be admitted and suppuration be little likely to occur. Successive filling and discharge through a tube have been noted.

Torsion of the Pedicle.—The symptoms produced by torsion of the pedicle vary with the rapidity and degree of the twisting. If the process goes on slowly, no symptoms may be produced. In a case recently operated on there were three complete turns, with obliteration of all the vessels of the pedicle, but there had never been a symptom to arouse any suspicion of such an accident. Again, if torsion comes on suddenly, the result may be gangrene of the cyst. This will be followed by the symptoms first of peritonitis, and later of septicæmia and collapse. Symptoms of collapse also may follow hemorrhage into the cyst, or there may be marked anæmia and loss of strength from the loss of blood. Peritonitis is a common result even when gangrene does not take place, and is shown by the usual symptoms of that disease. When the torsion goes no farther than to merely hinder the blood-stream, the growth of the tumor may be stopped or absorption take place. This is a very rare but fortunate event.

Hemorrhage into the Cyst.—As has already been stated, hemorrhage into an ovarian cyst may result from various causes. It is not uncommon to find evidences of more or less blood in the cyst

when it is opened. This may be only enough to color the fluid slightly, or we may find thick layers of fibrin of different ages, almost rendering the cyst solid. This, in my experience, occurs most commonly in a form of tumor rarely met with, which has very thick but soft walls, approaches the monocystic type, and grows slowly. Occasionally the hemorrhage may be so severe and sudden as to cause alarming symptoms of collapse. Parry[1] observed a case where this hemorrhage was so severe as to threaten a fatal termination. Thomas has also observed two similar cases. The cyst in Parry's case increased an inch or more in all directions in the course of a few hours. The cause of such a hemorrhage is not understood. Should it be as severe as in Parry's case, it might necessitate immediate operation to save life. In milder cases the only harm may be an increase in the general debility and anæmia.

Suppuration of the Sac.—Inflammation and suppuration of the interior of an ovarian cyst is one of the most unfortunate accidents to which it is liable. Unquestionably, one of the most common causes is the admission of air or foreign matter, and, therefore, germs, from the outer world. It is this which makes tapping and the withdrawal of a portion of the cyst-contents for diagnostic purposes so dangerous. There are also other ways in which foreign matter may be introduced. For instance, I have in my possession a specimen of a uterus in the fundus of which there are two holes. One hole was made by the uterine sound in my presence. There was also a suppurating ovarian cyst firmly adherent over its whole surface, the result of old peritonitis. There was a distinct history of the sound having been passed through the uterus on several previous occasions, as was proved by the other opening; and I have no doubt that after the peritonitis which followed the first puncture the sound entered the cyst, the walls of which were very thin. This sac was removed, but the patient died of the pre-existing septicæmia. I have several times seen suppuration follow tapping, particularly in the days before antiseptics.

The symptoms of suppuration of the cyst are those of septicæmia, which is an inevitable consequence of the presence of pus, moderately high temperature with very rapid pulse, gradual exhaustion, and death. The course of the disease may be run in a few weeks or may last for months. The cyst may rupture either through the abdominal wall, in the scar of an old puncture, as already mentioned, or into the intestines, bladder, or Fallopian tube. In either case the disease is not generally stopped, but, as there is imperfect drainage, the condition and symptoms remain the same, plus a constant discharge of pus.

The diagnosis is made by the presence of the symptoms, by testing

[1] *Am. Journ. Obst.*, Nov., 1871.

the character of the discharge if there be any, and also by the presence of gas within and a consequent tympanitic resonance over the tumor.

The treatment is to remove the sac if possible. Many such cases have been successfully operated upon. In considering the question of the spontaneous cure of ovarian cysts (p. 1054) the reader was referred to an account of the accidents which might end thus fortunately. A study of the causes and usual effects of these accidents must, however, prove that the cures happen very seldom, and are always the exception and not the rule, so that their occurrence should never be counted upon. Also it must be noted that the risks run by the patients are so great, even when a happy termination ensues, that we should never seek to imitate by art any of the plans sometimes followed by Nature, for the reason that far better and safer ones exist.

Complications.

Besides the accidents which have just been considered, certain complications may arise during the existence of an ovarian cyst which may render more difficult the diagnosis and materially interfere with the treatment. The first of these to be considered is

Pregnancy.—It is a well-recognized fact that the presence of an ovarian tumor of any kind or size in one ovary by no means interferes with the functions of the other, and consequently conception may take place. Even advanced disease of both ovaries may not produce sterility, and a number of cases have been reported where pregnancy has existed together with double ovarian tumors. In some of these cases no ovarian tissue could be recognized, though of course a few follicles must have escaped the destructive processes.

The presence within the abdominal cavity of two or perhaps three growing bodies is likely to cause a rapid and even enormous distension. As a result dyspnœa and the other effects of abdominal distension are apt to appear early and to become very marked. In some cases pain of an agonizing character has been experienced.

The pressure of the growing uterus on the tumor has been known to cause rupture of the latter into the abdominal cavity, with a resulting peritonitis. Cures have also been noted as following rupture under these circumstances.

Torsion of the pedicle is a peculiarly liable accident, and hemorrhages into the tumor are more likely to occur than in the non-pregnant condition.

As a rare accident suppuration of the cyst has been noted, particularly in dermoid cysts. An additional and generally fatal accident is ileus.

Not only is the tumor affected by the enlarged uterus, but the influence is reciprocal. In a considerable number of cases abortion and premature labor result, and both these processes are attended with more than usual risk. Jetter collected 215 cases, in which there were 21 abortions and 15 premature labors. Labor at the time is attended with unusual danger. If the tumor is small, it may come down before the advancing head and be an obstacle to further progress. In this case either pushing it above the pelvic brim or tapping the tumor through the vagina (not through the rectum) should be tried. Where the tumor is above the pelvis the mechanism of labor is apt to be interfered with and the puerperal period is rendered more dangerous. Rupture of the uterus has occurred at this time.

Statistics show the mortality to be very great (Jetter), but in the experience of some this has not been found to be the case. I have met with but three cases, in each of which labor was uncomplicated. In one I removed the tumor (forty pounds) a few weeks later.

In regard to treatment there are but two questions which may come up for consideration. If the pregnancy is discovered early, shall it be allowed to proceed or shall the tumor be removed or tapped? The results of ovariotomy during pregnancy have now become so good that it hardly seems justifiable to kill the child in order to prevent possible risks. Unless there is some very positive counter-indication this operation is safer and offers better results than tapping, and should always be resorted to.

Occasionally, especially if very near the end of gestation, tapping may be indicated, but it is not to be forgotten that the dangers of tapping are nearly as great as those of a well-performed ovariotomy. As the tumors always grow with especial rapidity during pregnancy, tapping is likely to be repeatedly necessary.

Rupture into the peritoneal cavity should generally be the signal for immediate operation. The same is true if torsion of the pedicle and obstruction of the bowels occur.

Ascites.—It is not very rare to find, together with an ovarian cyst, a certain amount of fluid free within the peritoneal cavity. This may arise, as in the case of ordinary ascites, from disease of the heart, liver, or kidney. Its presence then makes a complication which is serious just in proportion to the degree of the disorganization of the affected organ. In a recent case of a small ovarian tumor the writer found considerable œdema of the extremities, fluid in the abdomen, scanty and albuminous urine, dyspnœa, and rapid pulse. Under appropriate treatment the symptoms all subsided, the urine became free, the dropsy disappeared, and an operation was successfully performed. The patient has since remained well. Besides the ascites due to this cause we often meet with fluid around an ovarian tumor which is not dependent on

disease of any of the vital organs. This is particularly true of fibroids of the ovary and malignant disease.

Where there is an ordinary cyst the fluid is due to an irritation of the peritoneum, which may show itself simply as an increased vascularity of the parts or may in time pass to a true chronic inflammation. It will, as a matter of course, then be more apt to be found with tumors of long standing. In one recently operated upon of fifteen years' duration there were several quarts of free fluid. In another case, with a tumor weighing only about fifteen pounds, there were fifty pounds of free fluid. It was only from a previous knowledge of the case that a recognition of the tumor was possible. In this instance the whole peritoneum except that covering the viscera was fully half an inch thick and contained large plates of coagulated fibrin floating free. The presence of free fluid within the abdomen as an accompaniment of a tumor is of no particular clinical importance. It only shows that the tumor is not everywhere closely adherent, though it does not altogether exclude the presence of adhesions. It does not interfere with operation, but some have claimed that its presence in large quantities demands the use of a drainage-tube. In this I am inclined to agree, though confident that where there is only a moderate amount with a recent tumor no such necessity exists.

As a symptom of rupture of a cyst ascites is of more importance. In this case the tumor is likely to be felt as a small hard mass in the fluid, and may readily be mistaken for malignant disease. Only the history, and perhaps an exploratory incision, can complete the diagnosis. When only one small secondary cyst ruptures, the constant escape of the irritating contents may keep up the ascites and so increase the exhaustion.

Peritonitis.—Acute peritonitis, we have already seen, may result from rupture of a cyst and from torsion of the pedicle. It also occurs independently of these conditions, sometimes without assignable cause. I have several times seen it occur, in one case three times in quick succession, a successful ovariotomy having been performed as the third attack was subsiding. If the cause can be diagnosed as being due to either of the above-named accidents, it should be promptly treated by operation. If idiopathic the subsidence of the acute symptoms may be awaited before an operation is undertaken. The occurrence of idiopathic peritonitis is doubted by some. As already mentioned when treating of ascites, chronic peritonitis sometimes exists. It is no bar to operation. Its diagnosis is impossible or extremely difficult. Even the presence of free fluid in the peritoneal cavity is no certain test, as inflammation may exist without it. The peritoneum becomes greatly thickened, and so altered in appearance as to have lost the semblance of a serous membrane.

Obstruction of the Bowels, either partial or complete, is a rare complication of ovarian tumors. It is wonderful the way in which the intestines continue their functions notwithstanding the presence within the abdomen of a large tumor. A small tumor, still within the pelvis, by pressing directly on the rectum may cause much more trouble than a large tumor which has risen entirely above the pelvic brim. Still, occasionally we find, especially in those of constipated habit, large accumulations of hardened fecal masses within the intestine. Interference with the rectum may arise from adhesions resulting from pelvic peritonitis. Complete obstruction of the bowels may occur, and may be known by the usual signs. It can hardly result from simple pressure, but rather from bands of adhesion. It must be considered as an immediate indication for laparotomy, with removal of the cyst and constricting bands.

Septicæmia.—Simple septicæmia occurring in the course of an ovarian tumor may have for its cause either some change in the tumor itself, such as gangrene or suppuration of the cyst-walls, or may be due to some coincident disease not directly related to the tumor. I have met with it as the result of a collection of pus in the tube, and also from a pelvic abscess. In one instance such an abscess burst into the bladder and at the same time into the intestine, making a most serious complication. The diagnosis of the exact cause may be exceedingly difficult, and to eliminate disease in the tumor proper and malignant disease may require aspiration of the cyst to see if its contents be pus. It must be remembered that in some cases of simple cyst toward the end of the disease slight chills with an average rise of temperature of from one to three degrees is not uncommon. The existence of septicæmia must have an unfavorable prognosis on an operation whatever its cause. Still, the operation is all the more imperatively demanded.

Gastritis and Enteritis are symptoms met with generally toward the close of life. They show themselves by a dry, glazed tongue, vomiting and diarrhœa. The prognosis is eminently unfavorable and the call for immediate operation imperative.

Kidney Disease.—The mechanical interference with the stomach and liver, and consequently with their circulation and functions, has a marked influence on the urinary secretion. It is not at all uncommon to find the urine very scanty, high colored, extremely acid, and containing quantities of uric acid and urates. Such a condition of the urine, should it last long, months or years, must in the end have a deleterious effect on the structure of the kidney. The whole urinary tract becomes irritated and interstitial nephritis may in the end supervene. Such a condition of the urine should be corrected, if possible, by the free use of alkalies and the best of all diuretics, water. If an

operation be undertaken with the urine in this condition, more or less trouble is likely to result, as has been pointed out by Sir Spencer Wells.

Interstitial nephritis is difficult to diagnose, as albumen and casts are not always present in the urine, and it has doubtless been the cause of many deaths after ovariotomy. Œdema of the lower extremities is not generally due to it. Emmet has pointed out the danger of giving ether in these cases, and when the integrity of the kidney is suspected it will certainly be safer to use chloroform.

The kidneys may also be diseased as a direct result of pressure. The kidney is so well protected that pressure on the organ itself can seldom occur, but the ureter when it passes over the brim of the pelvis is more liable to be pressed upon. As a result of this we have dilatation of the ureter and organic changes in the kidney itself. Doran thinks that the condition of the urine which Spencer Wells has found so dangerous, before alluded to, is due to congestion of kidneys not healthy, but damaged by pressure.

The prognosis in cases of kidney trouble with an ovarian tumor, if the patient survive the operation, is eminently good, as the exciting cause is removed with the tumor, and the kidney, if not too much damaged, will not suffer further injury, but continue its functions indefinitely. The ureter sometimes becomes intimately associated with the sac-wall. In a recent case I was obliged to dissect out some eight inches of the ureter from the wall of a sac deeply attached in the pelvis.

Diseases of the Lungs.—Phthisis rarely occurs in the course of an ovarian tumor. It has been an observation, in which I think other gynecologists will agree, that consumption very rarely occurs in patients suffering from uterine or ovarian diseases. There seems to be an antagonism between them. This extends to ovarian as well as uterine tumors. Should phthisis be discovered in its early stages and an ovarian tumor of any considerable size exist, the presence of the tumor cannot but exert an unfavorable influence on the lung disease, as it would interfere with proper respiration and expansion of the lungs.

An attack of bronchitis is always a more or less serious complication, as the act of coughing is difficult and painful. For manifest reasons no operation should be undertaken until the cough has been cured. The use of ether in cases recently recovered from bronchitis, and in old subjects, is apt to bring on the disease. To prevent the bad effect of ether under these circumstances, Mr. Tait has devised an apparatus for warming the vapor. I have found it well in such cases to substitute chloroform.

Heart Disease.—Organic valvular disease does not necessarily exert a very unfavorable influence on patients suffering from ovarian

tumors. All depends on the character and amount of the disease. Of course the principal question for decision is whether the affection of the heart will permit an operation. For the decision of the question no certain rules can be laid down. I have several times operated when there was a marked valvular murmur, but where the heart's functions did not seem to be materially interfered with, and without bad results.

There is an impression altogether too firmly fixed in the mind of the profession that all cardiac diseases preclude any operative interference demanding an anæsthetic. The idea is entirely wrong; no such general rule can be laid down; each case must be judged for itself.

In the *British Gyn. Journ.* for May, 1886, Dr. Bedford Fenwick calls attention to the frequency of fatty degeneration of the organs, particularly of the heart, in cases of long-standing abdominal tumors. He found in a number of cases rapidly fatal after ovariotomy that the right side of the heart was thinned and the whole cardiac muscle in a state of fatty degeneration. This he attributes directly to the presence of the tumor. The condition he believes is not a rare one, especially in patients of middle or advanced life, and must have a marked effect on the prognosis and results after ovariotomy.

The diagnosis of the condition is difficult, but can be made out by, first, a very feeble, rapid, and excitable pulse; second, a very dull and feeble heart sound, especially over the right apex; third, a very short systolic rise in the sphygmographic tracing; fourth, a very great tendency to syncope.

The danger of operating in such a case must be very great, and this condition undoubtedly has caused many deaths both on the operating-table and within a few days after the operation. It is certainly a strong argument for early interference.

Uterine Diseases.—The uterus is almost always displaced by an ovarian cyst. I have never been able to observe that the displacement in itself caused any symptoms. The menstrual function is variously affected. There may be total suppression, menorrhagia, or even metrorrhagia. The size of the uterus varies. It is sometimes apparently enlarged, and again seems to be atrophied. The uterine appendages on the opposite side may be normal in condition. The tube on the affected side, making up as it often does a part of the pedicle, is always changed. This change may result in a complete atrophy of the tube from its incorporation with the coverings of the tumor or a greater or less hypertrophy. In one case I found it enlarged nearly to the size of a man's wrist and closely resembling an intestine. The tubes on either or both sides may be the seat of inflammation, even suppuration, and consequently filled with pus. The opposite ovary is often the seat of early cystic disease, and rarely of an abscess.

The practical point to be deduced from these facts is that in every case where an operation is done the opposite ovary and tube should be carefully examined and removed if found to be diseased. Also, the uterus, if retroverted, may be sewed to the anterior abdominal wall, thus permanently overcoming the displacement.

Hernia.—It might be supposed that the excessive increase of the intra-abdominal pressure would quite frequently cause an escape of the abdominal contents at the points of least resistance. As a fact, hernia is a rare complication of ovarian cystic disease. In one hundred recorded cases of my own I find inguinal hernia but once, and femoral, umbilical, and the other forms of hernia not at all. There is sometimes a distension or pouting of the navel from a coincident ascites, which somewhat resembles a hernia, and which may become the seat of a hernia after the operation unless attended to. This latter complication is not at all uncommon. The reason for the rarity of herniæ is that the avenues from which they usually escape are closed by the tumor, the abdominal contents being pressed away from rather than through the openings. Should a hernia exist, it has been recommended that it be cured at the time of the ovariotomy. The umbilicus can be cut entirely out, as there is usually sufficient redundant tissue.

Prognosis.

The tendency of all ovarian tumors, whether cystic or solid, is toward a fatal termination. The length of time which they may last has already been discussed. The exceptional cases in which they last for many years are so few as to have little influence in guiding us when we undertake to give an opinion as to the future. We are quite safe in making a universal prognosis in the case of ovarian cysts, at least so far as to say that the end is only a question of time, be it longer or shorter. If art steps in to remove the disease, the outlook changes at once. The best ovariotomists now expect a mortality of about 6 per cent.—figures which some have improved upon, but which are likely to represent the general average of a number of our best operators.

Diagnosis.

The diagnosis of a simple ovarian cyst to an experienced practitioner presents ordinarily few difficulties. Still, so many complications may arise that often the most experienced and practical ovariotomist will fail. The abdomen has been opened to find no tumor present, or to find it simply filled with fluid or occupied by a pregnant uterus, so that the utmost care should be taken to arrive at a correct conclusion.

Both the subjective and objective symptoms must be utilized. A careful history of the case from the patient's own lips, given without leading questions, is of importance. Generally, it will be quite simple and by no means conclusive. Further than this, the methods to be employed in making a diagnosis vary with the size of the tumor. Small tumors seldom attract attention, and are generally discovered by accident, as it were, in making a vaginal examination; while if the tumor is large enough to fill the abdomen, the patient is conscious of its presence and goes to the physician to ascertain its nature. If large, various methods of examination may be employed which are not applicable to tumors confined to the pelvis. It will be necessary, then, to consider the diagnosis of large and small tumors under separate headings.

Diagnosis of Small Ovarian Cysts.—As has been said, small ovarian tumors are seldom recognized by the patient, but occasionally by the production of pain or marked irregularities of menstruation—menorrhagia, for instance, and other signs of pelvic disturbance—they lead to a vaginal examination (for method see Vol. I.), and so are discovered. If quite small, they may lie to one side of or behind the uterus. They are usually smooth, movable, and painless, and generally the presence of fluid may be detected by the sense of touch.

Great aid may be had in the examination by the bimanual or conjoined method, one finger within the vagina and the other hand on the outside over the inlet of the pelvis. If the abdominal walls are not too fat and rigid, a great deal can be learned in this way. The principal things[1] with which such a cyst is likely to be confounded are a uterine fibroid, retroflexion of the uterus, extra-uterine pregnancy, and hydro- and pyosalpinx. The fibroid is to be distinguished by its density, and, in the great majority of instances, by the implication of the uterus in the growth, and by the fact that it is multiple. Retroflexion will offer no difficulty to the expert, whether it be of a pregnant or non-pregnant uterus. If pregnant, the symptoms alone should make the diagnosis. If non-pregnant, the passage of the uterine sound will remove all doubt. With extra-uterine pregnancy the difficulties are greater. The severe pains usually met with and the ordinary signs of pregnancy may be absent, but the shape and the feel of the tumor if Fallopian are entirely different. It is long rather than round, more dense, less smooth, and is also more fixed in the pelvis. An ovarian pregnancy the existence of which is doubted by many, but which does exist, as can be proved by a specimen in my possession, could not be distinguished.

Hydrosalpinx is always firmly fixed in the pelvis, and could not be

[1] Dr. P. F. Mundé has recently reported a floating kidney mistaken for a small ovarian tumor. The case is unique: *N. Y. Med. Journ.*, July 21, 1888.

distinguished from an intra-ligamentary cyst except by its history. If double, as is often the case, the chances would be in favor of the tubal origin.

Pyosalpinx greatly resembles a small cyst to the touch, but is almost always double, and there is a history of repeated attacks of pelvic peritonitis. The cysts lie on the sides, and are usually sausage-shaped and not spherical.

Diagnosis of Large Cysts.—If the tumor has reached sufficient size to attract the patient's notice, there will be certain subjective symptoms to which she will call attention. Some time before she will have seen that her abdomen was increasing in size. She may say that the enlargement was at first on one side, but this is often overlooked. She will have had no pain, or if any it is slight and confined to a certain locality in her abdomen. There is perhaps some disturbance in her menstrual functions and the digestive organs are more or less disarranged. The bowels are constipated, and the kidney secretion is rather scanty. If the tumor has lasted some time, a gradual emaciation, particularly of the upper part of the body, has been noticed. The time elapsing since the tumor was first noticed is often very short, even for large growths. On looking carefully at the patient the peculiar facies may be recognized, which with the history will at least arouse strong suspicions as to the true nature of the patient's trouble. To confirm the diagnosis it is essential that a careful physical examination of the abdomen be made. To do this satisfactorily it is necessary to have all the conditions as favorable as possible. In the first place, the whole of the abdomen, not simply a portion of it, must be exposed to the view and touch. It is perfectly impossible to exercise the delicate sense of touch on which we depend so much, to say nothing of the sense of sight, if any fabric intervenes between the finger-tips and the skin of the patient. Next, the patient must assume the recumbent position, that the abdominal muscles may be all relaxed. A hard bed or lounge will do for this, but a table is much better, as it raises the tumor more prominently forward, and from its being higher the examination is much easier and consequently better.

Let us suppose, then, that the patient is laid upon her back upon a table with the abdomen bare and the clothing loosened, the first thing to do is to determine whether the enlargement is due to the presence of a tumor or to some other cause.

Conditions Simulating Tumors.

There are a number of conditions which closely simulate abdominal tumors, and which have been frequently mistaken for them. These must be excluded as the first step in the diagnosis. They are—abnormal

accumulations of fat in the abdominal walls; accumulations of gas and fluid in hollow viscera; muscular spasm; free fluid in the abdominal cavity; and pregnancy.

Obesity.—In women in middle life, especially about the menopause, there is often a tendency to the excessive production of fat. The accumulation may be general, but is often much more marked about the abdomen than elsewhere. In women the fat is more apt to be in the abdominal walls than in the omentum, as in men. Occurring as they commonly do about the time of the menopause, and being accompanied by certain vague uterine symptoms, with more or less pain and inability to walk or stand, these cases are very deceptive unless the practitioner is on his guard. In one year no less than six such cases were presented to the writer for operation, on the supposition that they were ovarian tumors. To quote what I have written elsewhere:[1] "The diagnosis can be readily made by grasping the abdominal walls between the thumb and finger or between both hands, so as to appreciate its thickness, just as we would apply the same test to any other article. A layer of fat five or six inches thick spread over the abdominal walls is enough to account for the increased size without a tumor."

As additional aids to diagnosis it is to be remembered that large ovarian tumors generally induce great emaciation; that on percussing the abdomen when there is a tumor it will be uniformly flat except on the flanks; and that the tumor is firm to the touch. With fat there is much less sense of resistance, and always more or less resonance on percussion, especially if the hand used to percuss upon is pressed firmly and deeply into the abdominal walls. When very fat the abdomen hangs in folds as the patient sits up, and the umbilicus is retracted. The sense of fluctuation in a mass of fat may be misleading, but it is very different from the fluctuation of an encysted fluid. The true nature of the apparent fluctuation may be appreciated by percussing on some other fatty part of the patient's body, as the breast or thigh, when exactly the same pseudo-fluctuation will be perceived.

Large fatty accumulations within the abdomen are quite rare. They are more difficult to diagnose, but the absence of all other signs and symptoms of ovarian disease should be decisive.

Œdema of the abdominal walls has been mistaken for an intra-abdominal tumor (Peaslee). The application of the simple test of pitting on pressure should make clear the real nature of the trouble.

Tympanites.—It seems scarcely possible that the distension of the stomach or bowels with gas should be mistaken for a tumor. But the mistake has been commonly made, and not only made but acted upon. Simpson quotes six cases in which on opening the abdomen only tympanites was found. The absence of a tumor on palpation, and the

[1] *Medical Press Western New York*, Jan., 1888.

absence of fluctuation, with the tympanitic note on percussion, should certainly serve to distinguish the condition from a tumor, especially when taken with the history of the case.

Distended Bladder.—A distended bladder may bear a great resemblance to a cyst. Dr. Gooch (Peaslee) mentions a case in which a distended bladder in a pregnant woman was mistaken for an ovarian tumor, and a similar case occurred in my own practice. A woman who had been three days in labor was brought seventy-five miles on account of an abdominal tumor which was supposed to be ovarian and to be obstructing the labor. The passage of the catheter proved the tumor to be an enormously distended bladder. In Dr. Gooch's case a trocar was thrust into the uterus and into the head of the child. Other cases (see Peaslee) have been reported. In each there was a tense, non-sensitive cyst of some weeks' duration, greatly resembling an ovarian tumor. If the rule be followed to pass the catheter in every case of suddenly-developing tumor, all chance of making a mistake of this kind will be avoided.

Fecal Obstruction.—Besides being distended by gas, the intestines may be the seat of a great accumulation of feces. This forms in one hard mass or masses more or less separated. Several years ago I met with a case in which there were two large tumors in the abdomen and a third completely filling the pelvis, so that even a finger could not be introduced into the vagina. An examination *per anum* showed the latter to be hardened feces. Presumably the others were of the same kind, but the abdominal walls were fat and it was difficult to positively decide. A course of saline cathartics, however, removed the whole. In this case the patient was in perfect health, and suffered no inconvenience from the accumulation. Her physician had diagnosed double ovarian tumor.

The characteristic sign of a fecal tumor is that it will pit on pressure. If it can be reached through the rectum or vagina, this test is easily applied, but if not and the abdominal walls are thick or tense, a diagnosis may be difficult. A course of cathartics may serve to remove the mass and make the diagnosis clear.

The uterus, distended either by a growing fœtus or some fluid or gas, has frequently been mistaken for a tumor. It is essential that the possibility of pregnancy should be borne in mind when making a diagnosis in any case. This subject calls for careful consideration.

Pregnancy (Normal).—In the earlier months the danger of a mistake of this kind is slight. It is only after the middle of the fifth month that the uterus rises so high as to be likely to be mistaken for a tumor. That the breast-signs, cessation of menstruation, and fœtal movements may all be wanting is known. We must depend, then, entirely on the results of a physical examination; and it is in these

cases that mistakes are liable to be made. The shape of the tumor is generally different, the pregnant uterus being, as a rule, broadest at its upper part rather than in the middle. The uterus stands out from the pelvis more prominently than a tumor of the same size (Greig Smith). The sense of fluctuation is by no means clear in the uterus, and the uterine walls have an entirely different feel. Braxton Hicks has pointed out a most important sign in this connection. He has noticed that if the hand be held for some time on a pregnant uterus there will be noticed an alternate relaxation and contraction of the walls. This he maintains is a constant phenomenon, and serves at all times to distinguish a pregnant uterus from a cyst, which under no circumstances can have such contractions. As Tait says: "The relaxation and contraction of the uterus in pregnancy is a method of diagnosis which, when once made apparent, can never be mistaken for anything else."

In addition to this, we have later the auscultatory signs, which are very reliable unless the fœtus is dead. *Per vaginam* the characteristic softening of the cervix and vagina with ballottement will give efficient aid, and late in pregnancy the distinct sensation of a child in the uterus is unmistakable. With these means for arriving at a correct conclusion at our disposal it hardly seems possible for this mistake to occur, and yet it has been made many times, and by men of large experience and skilled diagnosticians.

Pregnancy (Abnormal); Hydramnios.—The rapid accumulation of excessive quantities of amniotic fluid usually in the earlier months of pregnancy may induce a condition which strongly resembles an ovarian or parovarian cyst. The mistake has often been made and the uterus tapped or the abdomen opened, not always with success. Tait says he knows of three fatal cases of tapping. It usually comes on in young primiparous women pregnant with twins, and the growth of the supposed tumor is very rapid. Great suffering may be produced unless aid is given, often the urine becomes albuminous. With such a history our suspicions should be excited, and a careful examination made. The usual signs of pregnancy will be found to exist. There will be the Braxton-Hicks sign already mentioned, together with ballottement, which will serve to make a diagnosis. It must not be forgotten that the uterine wall will be exceedingly thin from the great distension. The child will be very movable, and ballottement is an easily performed and important sign. Such cases seem to be very rare in this country.

Retroflexion of the Gravid Uterus.—It is not to be forgotten that this condition may exist even as late as the sixth month of pregnancy, and give rise to a tumor in the abdomen the exact nature of which will be difficult to determine. The vaginal touch will, to an inexperienced examiner, only tend to add to the confusion, for the cer-

vix will be drawn up and pushed firmly against the pubes, and behind it will be felt a tumor. If the bladder be distended, as it usually is, there will be two tumors in the abdomen, one softer and more fluctuating than the other—a condition sometimes met with in multilocular ovarian cysts.

The DIAGNOSIS must depend on the discovery of the true nature of the smaller cyst by the passage of the catheter, and then determining the fact of pregnancy by the usual symptoms, aided by the Braxton-Hicks sign.

EXTRA-UTERINE PREGNANCY.—If an ectopic gestation has lasted to the fifth or sixth month, its differentiation from a tumor of corresponding size may present many difficulties. The Braxton-Hicks sign is wanting, and we are forced to rely on the ordinary symptoms of pregnancy, fœtal movements, the fœtus being more than usually near to the examiner's hand, and auscultatory signs. The uterus is enlarged, but not enough to correspond with the supposed age of the fœtus, and is empty. In the eighth or ninth month, or after the death of the child, which occurs usually at the end of the ninth month, the fœtus can be felt through the cyst-wall with great distinctness. The fœtal sac is generally much more on one side of the median line than on the other, which is seldom true of an ovarian tumor. Long and careful observation will be necessary in order to arrive at a correct opinion. In some cases the diagnosis can only be made by opening the abdomen, a procedure which will be fully justified if no signs of fœtal life exist.

HYDATIDIFORM PREGNANCY.—This condition has several times been mistaken for ovarian tumor (Peaslee). The ordinary signs of pregnancy are present, together with an unusual enlargment of the uterus and the escape of blood or bloody serum from the vagina. Small portions of the degenerated chorion may also often be found in the discharges.

HYDROMETRA.—Besides the enlargement due to pregnancy, the uterus is sometimes enlarged by a collection of fluid within it, due to other causes. The fluid may be serous or bloody. The accumulation may be due to a closure of the cervical canal. The growth is rapid, the patient suffering but little, and menstruation is absent, as it occurs in women after the menopause. Mr. Tait met with one case which he recognized only while operating. Should suspicion as to the possible nature of the tumor be aroused, a careful vaginal examination would probably solve the difficulty. The condition is very rare, and may end by spontaneous evacuation of the contents of the uterus.

HÆMATOMETRA.—In occlusion of the cervix or vagina, congenital or acquired, the menstrual blood sometimes collects in the uterus or below it in the vagina, so as to form a large fluctuating tumor, reach-

ing even above the navel. This condition is more common than hydrometra. Usually there is a history of an entire absence of the menstrual flow, but with a menstrual nisus, accompanied by severe pain. The diagnosis must depend on a careful vaginal examination, with the use of the uterine sound if the atresia exists in the uterus. Amenorrhœa is a constant symptom; Atlee refers to three cases met with in his practice.

Physometra.—By this is meant an accumulation of gas in the uterine cavity. It is a very rare condition, and closely resembles tympanites in its physical aspect. As tympanites has been mistaken for a tumor, the same may occur with physometra, though it may seem inexcusable. The tumor is usually tense, tender, and may reach as far as the umbilicus. Unless the abdominal walls are very fat, tympanitic resonance will be marked and a vaginal examination serve to clear away all doubt. It usually occurs in hysterical women, and is often accompanied by an escape of gas from the vagina.

Phantom Tumor, Pseudo-cyesis.—This curious condition, which is by no means rare, has never been satisfactorily explained. It consists of a spasm of the abdominal muscles, with a collection of gas which somewhat simulates a tumor, but is more apt to be mistaken by the patient herself for pregnancy. A curious fact is that often some of the objective signs of pregnancy are present, such as milk in the breast, noted by Tait. The "tumor" is sometimes on one side only, and again it apparently distends the whole abdomen and is tense and tender.

In a case recently seen by the writer it was noticed that the patient when lying on her back touched only the pelvis and the shoulder-blades to the bed. This was largely concealed by the soft elastic qualities of the bed, but on putting her on a hard table it was very noticeable; a good-sized pillow could be easily put under the lumbar region. Nothing would induce her to relax herself and lie flat, but under ether the whole "tumor" collapsed, and the spinal curve with it. The use of an anæsthetic is the key to the whole situation, and makes a diagnosis both easy and certain.

Ascites.—Fluid accumulation within the peritoneum may cause an enlargement which will equal almost any ovarian cyst. As ascites is common, and as the mistake of opening the abdomen for a supposed tumor when nothing but dropsy exists has been frequently made, it is necessary to make the differential diagnosis very clear. In the first place, the history of the case and the expression of the patient may serve to make an approximate diagnosis at once. In ascites the *facies ovariana* is of course wanting. On inspection, the patient being in the dorsal position, there is little likelihood of mistaking ascites for an ovarian cyst unless the accumulation of fluid be very great. One glance to the experienced eye is often enough. With moderate ascites

the abdomen is flat instead of conical; the walls are lax and the flanks bulge, the greatest diameter being just below the pelvis. In the lesser degrees of accumulation the fluid will certainly gravitate to the lower parts of the abdominal cavity. With the patient in the dorsal position percussion will give resonance in front over a circular or crescentic area, the concavity of which is toward the chest, while the flanks will be dull. (See Figs. 349 and 350.)

FIG. 349.

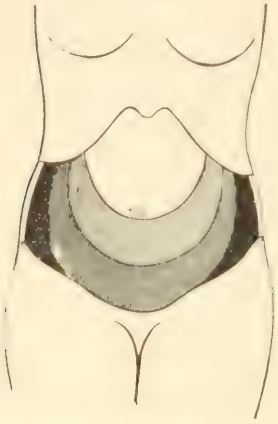

FIG. 350.

Diagrams showing Development of Areas of Dulness in Ascites (Fig. 349) and in Ovarian Tumor (Fig. 350). Darker shading indicates an earlier stage of disease (J. Greig Smith).

By change of position the dulness disappears in one flank and becomes greater in the other, or if the patient sits up the fluid gravitates toward the pelvis and an area of dulness is discoverable above the pelvic brim. When the distension of the abdomen is very great, so as to make the abdominal walls tense, the resemblance to a large ovarian cyst increases. Still, the appearance is different. The abdomen is flatter and less tense. The appearance of the skin is not the same; in ascites it is shining, tense, and smooth. Although there may be dulness over the whole abdomen to the sternum in ascites, there will not be resonance in the flanks, as is almost universally the case in cystic disease; there are very rare exceptions to both rules. Fluctuation is also much more distinct in ascites, the wave seeming longer and more decided than in ovarian cysts. This, however, is not a distinction in parovarian tumors, and it is with them that most mistakes occur. Nearly every parovarian cyst which has come under my notice has previously and repeatedly been diagnosed as ascites.

In very marked ascites a vaginal examination may be of service. Douglas' pouch is usually full of fluid, except where it has been obliterated by adhesions or a new growth, as in pelvic cancer, and may even

be forced out through the vaginal outlet, as in a case met with by the writer. Fluctuation is then easily detected. This may occur, however, from a small amount of fluid coexisting with a tumor.

Of all the signs, the history of the case, showing the existence of liver, kidney, and heart disease, together with the existence of dropsy elsewhere and the results of inspection, palpation, and percussion, especially the presence or absence of dulness in the flanks, are the most important and reliable. It must not be forgotten that ascites is a frequent accompaniment of an intra-peritoneal cancer.

Having excluded by the methods thus far discussed all those conditions which simulate ovarian and other tumors, we may safely conclude that a tumor does exist. Granting this, what are the signs which will prove to us that it is ovarian? How may we differentiate it from the other growths which more or less resemble it?

The Physical Signs of Ovarian Cysts.

These signs may be elicited by several means of examination, each of which must be considered by itself. For the examination of a large cyst we have, first—

Inspection.—Under this head we must consider inspection of the patient as well as of the abdomen. The facies ovariana already alluded to and the existence of emaciation must be looked for. On inspecting the abdomen it will be seen to be distended, either partially or fully. If partially, the principal enlargement will be in the lower portion, and quite generally greatest in the middle. Peaslee speaks frequently of tumors in the second stage as being on one side of the median line. This in my experience is a rare exception.

The distension is usually symmetrical, though this is by no means a universal rule. In multilocular cysts there is quite often a daughter-cyst which protrudes more at one point than another, making the outline of the tumor irregular. In this way the character of the cyst, whether approaching more nearly to the monocystic or the polycystic type, may sometimes be determined. Often the exact dimensions of the tumor, especially its upper line, may be made out.

If the tumor be very large the distension will be more symmetrical and the umbilicus may be prominent. It may even pout from coexisting ascitic fluid. The shape of the swelling differs entirely from that in ascites, being more globular or even conical, and without any bulging in the flanks. The skin is rarely tense and shining from œdema of the abdominal walls. The superficial veins are often enlarged, and linea albicantes may exist, similar to those found in pregnancy or other abdominal enlargements.

Mensuration.—As the tumor lies in the lower part of the abdomen,

unless it be of enormous dimensions, the greater part of the increase will be there. The distance from the pelvis to the umbilicus will be increased to a greater degree proportionately than from the umbilicus to the sternum. The broadest diameter, if the distension be great, will be at or above the navel, differing from that in ascites, which is greatest just above the pelvis.

Palpation.—The method of making palpation is important. The hand of the patient and of other physicians who may be bystanders should be withheld. Only one person at a time can properly examine an abdomen. The whole hand should be laid upon the abdomen and the finger gently pressed in and toward the tumor. In this way the character of the tumor can be made out. If not too large, it will be found to be round, smooth, and nearly globular. It may be freely or slightly movable, depending on its size and attachments and on the adhesions. Sometimes from the growth of secondary cysts the outline will be irregular, but still the surface will be smooth.

The degree of tenseness of the cyst may be appreciated, and, if the conditions are favorable, fluctuation recognized.

To get fluctuation, if the abdominal and sac-walls are both thin and the contents quite fluid, is very easy. One hand is laid on one side of the abdomen, and with the fingers of the other hand the opposite side of the abdomen is gently tapped. A wave or thrill will be felt, and often seen to pass directly from one hand to the other. In tense cysts with thick walls and moderately thick abdominal parietes a quite forcible blow with the finger-tips will sometimes elicit fluctuation when a lighter touch fails. If the abdominal cyst-walls are very thick and tense and the cyst divided by many septa, or the contents are a thick colloid, fluctuation may be entirely absent. I know of nothing so deceptive as a sense of fluctuation which is not absolutely certain. It is sometimes entirely impossible to decide whether in a given tumor fluctuation exists or not. In one case mentioned by Thomas after the tumor had been taken out and proved to be of a gelatinous consistency the sense of fluctuation was still apparently unmistakable.

Palpation will also often enable us to ascertain the presence of free fluid between the tumor and the abdominal walls. This is done by laying the hand flat upon the abdomen and then, with the fingers held stiff and bent only at the carpo-metacarpal articulation, a sudden and somewhat forcible movement must be made. In this way the layer of fluid is suddenly displaced, and the finger-tips come upon the firm cyst-wall, which can be then easily recognized.

When the cyst is large and completely fills the abdomen, very often by a similar movement with the finger-tips just below the end of the sternum the outline of the cyst-wall can be made out when it can be felt nowhere else. Sometimes crepitus can be felt between the surface

of the tumor and the abdominal walls. It excludes adhesions at that point.

Atlee considered the propagation of the pulsation of the abdominal aorta through the tumor to be pathognomonic of ovarian cyst. It certainly is not felt in ascites, but may be in other cysts.

Percussion.—While inspection and palpation are very important, it is on the evidences obtained by percussion that we lay the most weight. As the tumor grows up into the abdomen it pushes the other movable contents of the cavity before it. In this way it soon comes to rest against the abdominal walls in front and upon the spinal column behind. Consequently, when we percuss over the tumor in front we find uniform flatness. To this rule there may be a few exceptions. The tumor may contain gas either from decomposition with suppuration or from a communication with an intestine, or rarely, and in the case of small tumors only, a portion of intestine may be attached to the front of the sac-wall. This I have met with but once, in the case of a small cyst in which there had been torsion of the pedicle and peritonitis. Again, the tumor may be so small as not to reach to the abdominal walls, which in turn may be very lax and pendulous. As the intestine and stomach, if the tumor be large enough, are pushed up before it, percussion will reveal a sharp line where one ends and the other begins—the "tympanic corona," as Tait calls it. If the cyst completely fills the abdomen, the corona will be more or less broken in upon. Still, it can generally be found in the epigastrium, as I recently proved with a cyst weighing seventy pounds, and in one or both flanks. This point Atlee insists upon as very important, but there may be exceptions, for the intestines in the flanks may be filled with feces or there may be coincident ascites, in both of which cases the flanks will be dull.

Auscultation.—There is little to be learned in a positive way by auscultation. The sound furnished by the movements of the tumor due to respiration, by intestinal movements, or by the blood in the large vessels is of no practical value. It gives negative signs by which pregnancy may be excluded.

Vaginal Examination.—By the finger in the vagina comparatively little of a positive nature can be learned. Very often the tumor cannot be even touched. Again, it will be distinctly evident to the finger; the uterus may either be pushed backward or drawn up in front of the tumor. If the tumor is low, fluctuation can be distinctly made out between the fingers within and without. The evidence to be obtained by the vagina is more in the way of excluding a uterine origin for the tumor in case of doubtful diagnosis. The rectal examination will throw little additional light on the case.

For the diagnosis of intra-ligamentary cysts Goodell claims much

aid can be derived from vaginal examinations. (See "Diagnosis of Character of Cyst.")

Two points still remain to be considered in this connection—exploratory puncture and exploratory incision. Unquestionably, both these procedures are now considered much less important than in times past. For this the same reason can be assigned. The extension of abdominal surgery has made an accurate diagnosis of the character of a given tumor of much less importance than formerly. When ovarian cysts were the only ones which it was thought safe to remove a careful differentiation was a necessity. Hence every means possible was brought into requisition to enable one to make an accurate diagnosis before a removal was attempted. It has been found, however, that many other kinds of abdominal cysts, and even solid tumors, can be safely removed, and a mistake in diagnosis is therefore of less importance. Still, doubtful cases will arise where every possible means must be taken to arrive at a proper decision as to the probable nature of the growth. To this end the two procedures mentioned may be undertaken.

Exploratory Puncture.—The withdrawal of a small portion of the contents of an abdominal cyst for diagnostic purposes has been practised for a number of years. When Dr. Drysdale announced the discovery of the pathognomonic nature of his ovarian corpuscle, it received a new impulse, and for a while almost every tumor in which the slightest doubt existed was tapped and the fluid subjected to microscopic examination. Now, as Greig Smith says, "exploratory puncture has practically been abolished as a means of diagnosing ovarian cysts." With this opinion I would hardly agree, for, although I have not punctured a cyst for a number of years, I can imagine a case in which I might do so.

The objections urged against the procedure are that it is unsafe and uncertain. That it can result in serious trouble is well known; even the introduction of the hypodermic needle has been followed by suppuration of the sac and by peritonitis. The former danger can be obviated by strict antiseptic precautions—clean skin and clean needle. The danger of peritonitis—and the same may be said of hemorrhage—cannot be so easily avoided, as each is due to the puncture itself, a necessary part of the procedure. Through the hole in the sac a very irritating fluid may escape into the peritoneum and set up inflammation; the needle by passing through a large vein may produce a serious loss of blood. The uncertainty of the result depends on the fact that there are no absolutely pathognomonic cells or other appearances which can be relied upon for diagnosis. The Drysdale cells or corpuscles have unquestionably been found in cysts of the kidney. I have seen cells taken from such a tumor which corresponded exactly in appearance to the Drysdale cell and answered to all the tests. Garrigues[1]

[1] *Am. Journ. Obst.*, vol. xv. p. 35.

has made the same observation, and has also found them in the cyst of the broad ligament, in vaginal cyst, in ascites, and in other cysts. Garrigues is of the opinion that "the most important elements are columnar epithelial cells seen on side view." While he does not maintain that they are pathognomonic, he says that they show that the fluid comes from a cyst which is lined with columnar epithelium, and therefore that it is not ascites or fluid from a uterine fibro-cyst. Bennett's corpuscles are of no diagnostic value.

While all this may be true, the presence of a large number of Drysdale cells in a possible ovarian fluid must be taken as strong evidence on the positive side. The chemical evidence is no more positive, and the absence or presence of paralbumen is not conclusive, although its presence probably excludes ascites.

The specific gravity of the fluid has some bearing in the same direction. According to Spiegelberg, the density of ovarian fluid averages from 1.018 to 1.024, ascitic fluid being only 1.010 to 1.015. The paper of Dr. Garrigues above referred to is very exhaustive. The method of withdrawing the fluid is simple. An aspirator or hypodermic syringe may be used, strict antisepsis—that is, cleanliness—being absolutely necessary in order to avoid trouble.

The Exploratory Incision.—Opening the abdomen for purely diagnostic purposes has, in ovarian cystic diseases, a very limited usefulness. But the exploratory incision has another and wider field of application. While the mere presence of an ovarian cyst may be almost always diagnosed with sufficient certainty to warrant operative interference, the exact condition of affairs within the abdomen, the absence or presence of adhesions and other complications, some of which may render an operation impossible, cannot be so readily made out. Thus in a certain sense every laparotomy for suspected ovarian cyst becomes an exploratory incision. Every exploratory incision should end in a completed operation if it be found possible. The risk of simply opening the abdomen unless cancerous disease be present is certainly very slight, provided of course that it is done with proper care. By proper care is meant the absolute preservation of an aseptic condition and not injuring the parts within the abdomen in any way. If there is good ground for suspecting cancerous disease, the risk of operating is greater, and unless the doubt is considerable no operation should be undertaken. In this I do not include solid ovarian sarcomata.

Diagnosis of the Character of the Tumor.—A careful examination will reveal much besides the mere fact that an ovarian cyst exists. True ovarian monocysts are very rare, but many tumors approach quite closely to the monocystic type. This may be made out by the uniform and smooth outline and special shape of the tumor. If

there are irregularities or projection of one portion more than another, the tumor is quite surely a multilocular cyst. As to whether there are two separate cysts, it is seldom possible to determine unless they are quite small and move independently of each other.

The intra-ligamentary cyst has certain peculiarities which sometimes enable us to distinguish it from the ordinary ovarian cyst. Dr. Goodell has described the diagnostic features of this form of tumor so fully that it is not necessary to repeat their description. (See p. 829.) While the existence of a number of the signs mentioned by him in a given case make the diagnosis of this kind of tumor probable, it must not be forgotten that a malignant growth may produce a series of phenomena which will bear a very close resemblance to them.

The character of the fluid may be made out to a certain extent by the sense of fluctuation. If the wave be short, quick, and very distinct, the fluid is probably thin. If, on the contrary, the wave seems to move slowly and to be indistinct, the fluid is probably thick. This is a matter, however, of very slight importance.

Adhesions.—Sir Spencer Wells claims that much can be learned by examination as to the nature of the adhesions in any given case. He relies on the respiratory movements and on percussion and auscultation. A considerable experience has convinced the writer that it is rarely possible to tell anything about adhesions. The existence of free fluid between the cyst and the abdominal walls is perhaps as sure evidence of the absence of parietal adhesions as anything, but occurs rarely, and does not tell anything about the existence of pelvic adhesions, which are in reality the worst of all. With this exception I agree with Mr. Tait, who says: "There is no possibility of determining by inspection or any other method the presence of adhesions anywhere in case of an abdominal tumor." I once operated on a patient who had a small solid pelvic tumor which seemed to be freely movable within the abdomen, the parietes being thin and quite relaxed. On cutting down I found the peritoneal cavity so entirely obliterated by old adhesions that I could not find it at all, and was forced to abandon the operation. What is true of adhesions is also true of the diagnosis of the character of the pedicle.

Differentiation of Ovarian Cysts from Other Tumors.

The tumors which are most apt to be mistaken for ovarian cysts are—

Encysted dropsy of the peritoneum;
Tubercular peritonitis (encysted);
Soft uterine myomata;
Uterine fibroids and fibro-cysts;

Cysts of the broad ligament;
Renal and other similar cysts.

Encysted Dropsy of the Peritoneum.—Sometimes, though the condition is a rare one, fluid collects in a portion of the peritoneal cavity, and is surrounded by exudations and false membranes, omentum and intestines making a pseudo-cyst. It usually occurs below the umbilicus, but may be found in any part of the abdominal cavity, and is rarely median. Such a cavity contains a thin fluid which fluctuates freely, and its walls are not usually tense. It does not have a clear outline, and a cyst-wall is hard to detect. On percussion resonance is sometimes found between the tumor and the pubes, an exceedingly rare event in ovarian cysts. Being surrounded by intestines, it is sometimes movable, and often seems to spring, as it were, from the intestines; the latter being adherent to the wall, the line of dulness remains the same in changing the patient's position. It usually contains a straw-colored fluid showing albumen and, some have asserted, ovarian corpuscles. While the signs may sometimes be enough to distinguish such an effusion from an ovarian cyst, in other cases a diagnosis is impossible and mistakes have been frequently made.

Tubercular Peritonitis.—Dr. W. T. Howard[1] has called attention to the difficulty of differentiating tubercular peritonitis with encysted fluid from an ovarian cyst. The only difference between this condition and the one just described is in its extent and cause. Here, instead of a small circumscribed collection of fluid, we have the whole abdomen occupied, as in ascites, but shut in at the same time by an inflammatory pseudo-cyst. If seen early such a case would show all the signs of an ordinary ascites, but after an adhesive peritonitis has shut up the fluid the similarity to ovarian disease is very strong. Spencer Wells describes such a case which he mistook for a thin, non-adherent, unilocular ovarian cyst. Atlee, Busey, and William Gardner have also reported cases. According to Howard, they occur early in life, generally under thirty years. They grow very rapidly, in from four weeks to eight months, and there is usually some sign of tubercular trouble in other organs. Dr. Gardner noted a red blush and œdema of the central part of the abdominal wall, which Loomis states is characteristic of tubercular peritonitis. The fluid withdrawn in Howard's case was a light straw color, and coagulated firmly on exposure to the air. With all these points to help a diagnosis may sometimes be made, but owing to the extreme rarity of these cases they are likely to be overlooked and mistakes in diagnosis to be made. If in doubt an exploratory incision, with free drainage if the diagnosis be confirmed, would be entirely justifiable.

Soft Uterine Myomata.—There are few conditions more puz-

[1] *Gyn. Trans.*, vol. x.

zling than a soft, smooth, round, single myoma attached by a pedicle to the upper part of the uterus. The sense of fluctuation is of course absent, but pseudo-fluctuation is present, which very closely resembles that found in a thick-walled, tense ovarian cyst with colloid contents, and which will deceive the very elect.

The signs obtained by percussion and inspection will throw little additional light on the case. The tumors sometimes grow rapidly, following quite close on a confinement. If the abdominal walls are thick with fat, the difficulties are still further enhanced. The history of the case will often be of value, but in general the symptoms resemble closely those of ovarian cysts. If menorrhagia be present, the chances are all in favor of a myoma, but this is not a constant symptom and may occur with an ovarian cyst. The facies ovariana is wanting, also the rapid emaciation. These two points should attract attention and lead to great care in making a diagnosis.

The vaginal examination is often of much value. Close fixation of the uterus to the tumor and considerable enlargement of the uterus are strong probabilities for the uterine origin of the growth. But the crucial point is the sense of touch, including the test for fluctuation. If this fail to determine whether the tumor is solid or contains fluid, exploratory puncture or an exploratory incision alone will decide. Very little is said in the literature regarding the difficulty of differentiating these two tumors. The writer must confess to having made the mistake several times, only discovering the error after an operation had been begun; nor has he been alone.

Uterine Fibroids and Fibro-cysts.—True solid uterine fibroids can rarely be confounded with ovarian disease. Their density and irregularity, as well as the history of the case and the almost certain involvement of the uterus, serve to make the diagnosis easy. With fibro-cystic disease of the uterus the case is quite different. These cysts are fortunately very rare. Spencer Wells says they occur in proportion to ovarian cysts as one to fifty—an experience which will exactly agree with that of the writer, he having met with three cases which were so diagnosticated, the correctness of the diagnosis in two of them having been proved by autopsy. They usually occur in middle life, grow very slowly, produce little effect on the patient's general health, and are not accompanied by emaciation or the characteristic facies. They attain enormous size. When palpated they sometimes resemble exactly a unilocular ovarian cyst; in other instances the surface is quite irregular, hard in some spots and fluctuating in others. Sometimes hard fibroid masses can be felt connected with the cyst. On vaginal examination the uterus is generally found enlarged and closely attached to or growing into the tumor, as it were. On moving the tumor, if its size will permit, the uterus is found to move with it.

Hegar has recommended to etherize the patient, and then with the cervix drawn down by a hook to examine with two fingers in the rectum for the uterine connections.

The fluid contained in these cysts was thought by Atlee to afford a certain means of diagnosis. The peculiar spontaneous coagulation of a thin straw-colored fluid which often contained muscular fibres he considered to be pathognomonic of this disease. This, however, has been proved not to be the case. Other fluids coagulate spontaneously, and the writer as well as others has found smooth muscle-cells in ovarian fluid. In many cases, then, we will be forced to Tait's conclusion, that the diagnosis of fibro-cysts is a very difficult thing, and "that it is possible only in the hands of a surgeon who has made two or three previous mistakes." A consoling conclusion, at least for most of us!

Broad-Ligament or Parovarian Cysts.—As a special section will be devoted to the consideration of these cysts, the subject of diagnosis will be deferred. (See p. 1084.)

Renal Cysts.—Cysts of the kidney, as well as cysts of the pancreas, spleen, and omentum, have all been mistaken for ovarian tumors. Such a mistake should only occur when the cyst has attained sufficient size to completely fill the abdomen. If small, their true attachment should be easily made out, at least their non-pelvic origin. In this way the history of the case—where it was first noticed and especially in which direction it grew—is of great importance. If renal cysts are rare, the others just mentioned are still rarer—so rare, indeed, as to be mostly mere objects of curiosity. The three kinds can seldom be distinguished from each other.

Renal cysts, unless beginning in a floating kidney which has been greatly displaced, always have their origin far above the pelvis and extend downward. They are at first on one side of the median line just below the false ribs. They grow very slowly, and do not produce the constitutional derangements met with in ovarian enlargements. On inspection they are rarely symmetrical, and on palpation they seem to have their origin in the lumbar region, where they are deeply and firmly attached. Percussion, even in large cysts, often shows a line of resonance between the cyst and the pubes; one flank is resonant, and often the large intestine lies in front and to one side of the tumor. If percussion does not reveal it, it can be recognized by palpation. The vaginal examination gives simply negative evidence. If the opposite kidney is sound and the secretory function of the affected kidney be destroyed, there will nothing abnormal be found in the urine. In some instances it will contain pus and blood or simply albumen.

The fluid from these cysts is usually light straw color, and according to Peaslee contains no albumen, though Greig Smith states that it

is albuminous. In rare instances a colloid fluid is found or the fluid contains blood. Cholesterin and "ovarian corpuscles" have been found in the fluid of these cysts.

While the tumors and conditions so far considered are most likely to be confounded with ovarian cysts, it is not to be forgotten that there are many other kinds of tumors met with in the abdomen, some or all of which may be confounded with ovarian cystic disease. Some of them will be fully considered in sections of this article that are to follow, and to which the reader is referred. Others are so far removed from the pelvis, and are so seldom met with, that their consideration here would be out of place. The writings on ovarian tumors of Atlee and Peaslee, as well as the work of Greig Smith on *Abdominal Surgery*, will supply all needed information. For the differential diagnosis of pelvic inflammatory effusions, hæmatocele, and abscess, as well as for diseases of the Fallopian tubes, the reader is referred to the articles on those subjects.

Dermoid Cysts of the Ovary.

"About one of ten ovarian tumors is either entirely or partially dermoid," says Greig Smith. This proportion is rather larger than that given by some writers, but may be accepted as generally correct. It is a curious fact that in the negro race the relative frequency of dermoids and cystomata is reversed. While true ovarian cysts are of extreme rarity, dermoids are quite common. This, while it cannot be explained, is of great importance from a diagnostic point of view.

The prevailing theory of the pathology of dermoid cysts makes their origin in some fault of development in the fœtus. Although born with the individual, they seldom show themselves before puberty, and may remain quiescent until middle life or even old age. When they begin to grow their increase is usually slow, and they rarely reach a great size, seldom weighing over ten or fifteen pounds. Consequently, they are usually found in the pelvis, and the symptoms they produce are referred to that region. Here they press upon and interfere with the functions of the bladder, rectum, and uterus. Sometimes, even when quite small, they become very tender and painful, causing difficulty in locomotion and dyspareunia. The menstrual congestion increases the pain, producing dysmenorrhœa. When large enough to reach above the pelvis, they are attended by the symptoms usual to ovarian cystomata. Quite often we find a dermoid growth united with an ordinary cystoma, usually of the colloid variety. When this occurs the compound tumor has all the characteristics of the ordinary cyst.

Dermoids are more liable to complications than cystomata. From their small size and their situation in the pelvis they are often injured in labor. They are particularly liable to inflammation and suppuration and decomposition of their contents, also to torsion of the pedicle and to rupture. They frequently rupture into the vagina or rectum. When this occurs, if suppuration has not already taken place, it quickly follows. The progress of the case is then extremely slow. The hair, skin, bones, and other similar tissues found in the sac cannot get loosened from their attachments, and by their presence prevent perfect drainage, granulation, and shrinkage of the sac. Thus the discharge may be kept up for years or until the patient dies of sepsis and exhaustion. If rupture takes place into the peritoneal cavity, peritonitis and death are quite certain to follow unless art intervenes to save the patient. Another complication which often occurs without rupture is peritonitis.

The diagnosis of dermoids cannot ordinarily be made unless their contents can be seen. This may be done as a result of their rupture or from an exploratory puncture. Then the characteristic fatty fluid with bones, hair, or teeth will make clear the true nature of the case. Occasionally bony plates may be felt through the abdominal walls in the sac. When small they may be mistaken for inflamed ovaries, pyosalpinx, or ovarian cystomata. An operation alone is likely to decide the true nature.

The prognosis of a pure dermoid differs from that of a cystoma, for dermoids grow much more slowly, may remain quiet for years, seldom attain a great size, therefore rarely kill unless some complication arises. The proneness to the complications already mentioned adds somewhat to the danger. If colloid degeneration is joined to a dermoid, the course of the disease is similar to that of a cystoma.

Fibroids of the Ovary.

Both fibromata and myomata of the ovary are asserted to exist, but clinically they offer no points of difference. Classing them together as "fibroids," they have certain clinical features which often enable us to recognize them. They are very rare. Sir Spencer Wells met with three cases in his first thousand ovariotomies; Greig Smith asserts that of all tumors (including malignant) of the ovary, not more than 3 per cent. are solid; Doran has never met with a fibroma; the writer has removed one undoubted ovarian fibroma.

These tumors rarely attain a great size, few having been met with larger than the adult head, and more often they are quite small, sometimes not larger than an egg. They grow very slowly, are usually freely movable, and seldom form adhesions. They are unaccompanied by

pain unless they are of large size. Their irregular shape, small size, and long narrow pedicle render these tumors very prone to be turned on their axis, and thus to produce torsion of the pedicle. This generally results in gangrene of the tumor and death. Another complication, which may almost be considered the rule, is the occurrence of ascites. The reasons for this are not well understood.

The diagnosis is not easy. They are with difficulty distinguished from malignant (sarcoma and carcinoma) tumors and from uterine fibroids. Malignant tumors, however, grow much more rapidly, are less freely movable; both may be associated with proportionately large ascitic accummulations. Fibroids of the uterus are usually closely connected with the uterus, are generally multiple, and are very rarely complicated with ascites. If, then, with a small, slowly-growing, solid tumor, which is freely movable and unconnected with the uterus, we find a considerable accumulation of fluid free in the abdominal cavity, we may with a degree of certainty decide that we have to deal with an ovarian fibroid. Such a series of favoring conditions is but rarely met with. Care should be taken to distinguish these tumors from the pregnant uterus.

Cystic degeneration of ovarian fibroids has been described. The diagnosis can very rarely be made, as they closely resemble uterine fibro-cysts and multilocular ovarian cysts.

As the operation is usually easy and safe, there can be no hesitation in recommending the removal of all ovarian fibroids after they have become large enough to cause the slightest inconvenience.

Parovarian Cysts or Cysts of the Broad Ligament.

The term "parovarian cyst" is now generally applied to a peculiar form of tumor which many authors think should be known as "cyst of the broad ligament." Be the nomenclature what it may, we generally understand by either of these terms a tumor which has certain clinical as well as pathological characteristics by which it may generally be easily recognized.

Parovarian are by no means as common as true ovarian cysts. I have been unable to find any tables showing the relative frequency of the two, but from experience I should say that they occur about as one to twenty-five. They usually grow very slowly, and affect the general health and comfort of patients very much less than do ovarian tumors. One recently met with had lasted from five to six years with the production of very little emaciation, loss of strength, or discomfort, although it weighed nearly thirty pounds. But there are exceptions. Tait met with two which had reached a great size in only five and seven weeks respectively, and one met with by the writer had attained

considerable size in a few months. There being usually no emaciation or suffering, the facies ovariana is wanting. On examination they are often mistaken for ascites. This was done repeatedly in every case which has come under my notice before a correct diagnosis was made and the case sent for operation. The reason for this is that the cyst-wall is, as a rule, very thin—like tissue-paper, Mr. Tait says—and the sac not being at all tense, but rather flaccid, the palpation wave is communicated with great force and rapidity in every direction, thus closely resembling dropsy. Again, the flaccid sac lies flat and not pointed or almost conical, as is often the case in ovarian cysts. The same rules as to the diagnosis of the presence of a sac rather than free fluid hold good as in ovarian cysts—dulness all over the tumor, with resonance in one or both flanks and in the epigastrium. From the soft, yielding character of the sac it is very difficult to actually feel it; but this may sometimes be done by having the lower part of the abdomen forcibly pressed upon by an assistant while the surgeon practises palpation above. To distinguish them from ovarian cysts we have their monocystic structure, flaccidity, thin walls, and rounded symmetrical outline, together with the absence of constitutional disturbance. If tapped, the fluid is usually like spring water, containing little or no albumen and no cells. But to most of these rules there are exceptions. Tait met with a case in which the walls were half an inch thick, and both Tait and Spencer Wells have seen cases which were multilocular. The fluid also sometimes contains blood or pus, or is thick and colloid in consistency. These tumors are subject to about the same complications to which ovarian cysts are liable, especially rupture, suppuration, and torsion of the pedicle. The prognosis is better than in cystomata. As they do more or less harm, and are liable to certain complications, removal is generally advised.

Extra-peritoneal Cysts.

Mr. Tait[1] has described a rare form of tumor, formed from the patent urachus, which sometimes closely resembles ovarian and par-ovarian cysts. In the *Annals of Surgery* Dr. I. A. Freer has collected certain cases of a similar nature.

These cysts are frequently quite small, but several of Mr. Tait's twelve cases were very large, containing thirty pints or more. There seem to be two varieties of the tumor, but the distinctions between them do not seem to be very clear. They frequently communicate with the bladder, and sometimes rupture at the umbilicus. The walls are described as being formed of a "peculiarly gelatinous, friable material," sometimes containing smooth muscular fibres and lined with

[1] Tait: *Brit. Gyn. Journ.*, Nov., 1886.

epithelium resembling that found in the bladder. They occur usually in young women, the oldest of Tait's cases being forty-one years of age. They grow somewhat rapidly, and are very prone to suppuration, although in some of Tait's cases the fluid was described as clear. They often contain, besides this fluid, free flocculi of "delicate omental membrane." When a communication with the bladder exists, it does not always allow of the escape of the cyst-contents, but by a valve action it permits the entrance of urine into the sac. When this occurs, decomposition of the urine and cyst-contents soon follows. If simple and no suppuration has taken place, these cysts may greatly resemble parovarian cysts; but if the contents have become putrid, hectic fever and the symptoms of sepsis will follow. Pain is not usually a prominent symptom.

The prognosis is usually unfavorable on account of the tendency to suppuration.

The diagnosis is difficult: cases have been mistaken for ovarian and parovarian tumors and for ascites. In well-marked instances, according to Tait, "the pelvic dulness is absolute, whilst the dulness which is obtained above the umbilicus is not so, although it is perfectly certain that the wave of fluctuation passes through one volume of fluid not intercepted by any cyst-wall;" or, expressed in another way, "on percussing the region of the abdomen the percussion note was absolutely dull, while it became more and more resonant as we went farther up toward the umbilicus and above it, yet the physical signs above the umbilicus were clearly those of encysted fluid."

The uterus generally seems to be quite fixed, and is sometimes covered on both sides by a double fold of the cyst-wall. In some cases it is displaced backward.

The writer has met with a single instance of this disease. There was an opening at the umbilicus and into the bladder, which contained a large stone. The suppurating cyst was laid freely open and the stone removed through the vagina, a fistula being left for drainage. The upper opening into the bladder soon closed. Later, two openings were found in the wall of the sac. One led into a small dermoid cyst. Its contents, teeth, hair, and bone, having been removed, this soon closed. The other opening led into the small intestine near the stomach. Through this came a fluid which digested or dissolved everything with which it came in contact. As the patient's condition was very precarious, resection of the intestine was tried, but in her weakened state the shock of the necessarily long operation was too much for her, and she died soon after recovering from the anæsthetic.

Cancer of the Ovary.

The general clinical features of cancer of the ovary differ in no respect from those of cancer of other parts of the peritoneal cavity. Rapid growth, quickly-increasing emaciation, and loss of strength are among the most striking features. Pain, burning and lancinating in character, which is popularly supposed to be a necessary accompaniment of cancer everywhere, is really a rare symptom. In not one case of ovarian or intra-pelvic cancer met with by the writer has pain been very prominent, and in many cases has been absent altogether. The pressure and tension from an ascitic accumulation, when existent, has caused more pain and discomfort than the growth itself, as shown by the relief afforded by tapping. In nearly every case sooner or later ascites develops and increases with great rapidity, returning more and more quickly after each tapping. The cases of large solid carcinoma without involvement of surrounding tissues sometimes afford an exception to this rule.

The cancerous cachexia is developed late, and differs markedly from the emaciation and loss of strength met with in ovarian cystomata. Disturbance of the digestive organs is usually developed very early, making it very difficult to sustain the patient's strength. Constant vomiting and nausea are met with, especially toward the latter end of the disease.

The duration of ovarian carcinoma varies with the kind. Although the growth may increase very fast, the patient does not lose strength proportionately. In some cases of hard cancer several years may elapse before the end is reached. In other cases of rapidly-growing soft cancer even a few months may bring the patient to death's door. There can, then, be no rule as to the time a patient may be expected to live after the disease is once detected, though probably few will last more than two years. The writer can advise that in making a prognosis the attendant should be careful not to predict the end too soon. Many cases have lived for months after they have been given up to die.

The diagnosis of cancer often presents very great difficulties. Sometimes the previous history of the case will afford material assistance. As carcinoma of the ovary is often secondary to cancer elsewhere, the occurrence of a solid ovarian or pelvic tumor after the extirpation, for example, of a cancerous mamma, should always be looked upon with the greatest apprehension. So, again, the occurrence of a solid pelvic tumor soon after the operation of ovariotomy should be viewed with suspicion. Tait, Thomas, and other observers, as well as the writer, have repeatedly seen cancer in the other ovary follow in a short time the removal of one ovary for cystic disease. This I have observed in

five cases within a few years, and in none of them was there any reason to suspect that the original disease was malignant. The diagnosis of carcinoma cystieum can hardly be made before an operation, though its presence may be suspected by the rapid growth of the tumor and failure of the patient.

With a large solid tumor the diagnosis must lie between carcinoma, sarcoma, fibroma, and uterine myoma. Slow growth and general good health will be on the side of fibroma or myoma, while rapid growth and marked general disturbances of nutrition soon follow the malignant tumor. The myoma will be more or less intimately connected with the uterus, as may be determined by vaginal examination. In several cases of malignant tumor of the ovary seen by the writer there was an evening rise of temperature amounting to three or four degrees. With small tumors the occurrence of ascites is by no means characteristic, as it is a frequent concomitant of fibroids of the ovary. While in a given case, owing to the frequency of cancer and the rarity of fibroma, the chances may all be in favor of the malignant nature of the growth, still only careful watching can decide. The rate of growth will be the most important point in enabling one to arrive at a correct conclusion. Fibroids of the ovary grow very slowly.

When a tumor begins to infiltrate the surrounding organs, by both abdominal palpation and vaginal examination certain characteristic points may be made out. By palpation of the abdomen the outlines of the tumor will be firmly fixed, and if very uneven small isolated points may often be recognized. In order to fully appreciate this it may be necessary to first draw off the ascitic fluid. By the vagina there will be a stony hardness all over the pelvic roof, with sometimes here and there nodules rising to greater prominence.

Cancer is eminently atypical in every way, and it is impossible to predict or describe a regular course for the disease. As it sometimes closely imitates other diseases, we may be driven to a diagnosis by exclusion; and after having eliminated every other possibility, if we are still in doubt, but one resource remains—viz. exploratory laparotomy. In this way alone can we decide with positiveness, but it is not to be forgotten that the dangers of laparotomy with cancer are slightly greater than when the disease does not exist.

Sarcoma of the Ovary.

Ovarian sarcoma, as has already been stated, is rather more common than carcinoma. Among 147 cases of ovarian tumor recently recorded by various operators[1] there were six sarcomata and five carcinomata. Clinically, sarcoma does not materially differ from true cancer. It is

[1] *Pittsburg Med. Review Supplement*, 1888.

almost equally malignant, although the tendency to return after removal is not always as great. There is no tendency to invade contiguous tissues, although metastases are more common. Ascites is not quite so common as with carcinoma. Pain is not usual except from extreme distension. Sarcoma usually forms rounded, smooth, hard tumors. Both ovaries are very commonly affected. The tumors are usually movable unless too large, and are not often adherent. The chances of being able to distinguish this tumor from any of the other solid ovarian tumors are very few indeed. There is no certain rule by which it can be done. The same may be said of the still rarer form of solid ovarian tumor, enchondroma. Many sarcomata have been successfully removed, the operation differing in no respect from that of an ordinary ovariotomy except in the length of the incision.

DISPLACEMENTS OF THE UTERUS.

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Historical.—There are passages to be found in the writings of Hippocrates, Moschion, and Aëtius which prove that inclinations of the uterus before and behind were not unknown to the ancients. It is, however, exceedingly probable that these old authors had knowledge only of deviations which had occurred in impregnated uteri. In 1732, according to Winckel,[1] Kuhn or his pupil Reineck is said to have demonstrated in the corpse the existence of retroversion of the gravid uterus. Previous to this century only isolated cases of displacement, forward or backward, of unimpregnated uteri were published, which were either accidentally discovered in the corpse or came to the knowledge of the physician by reason of symptoms which possibly were due to the complications. In 1817, Schweighauser published his views upon this subject founded on quite extensive experience, and maintained that backward dislocation in the unimpregnated was more frequent than in pregnancy. Flexions were considered as much rarer than versions. After Simpson, Huguier, and Kiwisch had introduced the use of the uterine sound the frequency of uterine deviations was generally recognized. In this country the writings of Dewees, Meigs, and Hodge were useful in disseminating a knowledge of this subject, while later the views of J. Marion Sims were undoubtedly of so suggestive a character as to lead to valuable investigations in this field. No one writer, however, who has discussed this theme has produced such a change in current views as B. Schultze of Jena. To him is indisputably due the great merit of having directed investigation into the right channels.

Preliminary Observations.—It is a matter of paramount importance, before entering upon a consideration of the pathological changes in the position of the uterus, to ascertain in the first instance what its normal position is. In the first volume of this work the writer of the article on the Anatomy of the Female Pelvic Organs did not find himself called upon to enter on this subject at any length, and

[1] *Lehrbuch der Frauenkrankheiten*, p. 336.

hence the necessity of discussing it here. In our country Van de Warker[1] and Foster[2] have written excellent articles on this question based on original researches, which are well worthy of careful perusal. Dr. Ambrose L. Ranney's brochure upon *The Topographical Relations of the Female Pelvic Organs* contains a most thorough discussion of this whole subject. For my own part, from careful clinical observation I am convinced that the doctrines advocated by Schultze are, in the main, correct, and in the following discussion I shall follow his exposition, though I shall not adopt his views *in toto* unreservedly. That the normal position of the uterus cannot be decided by an examination of the cadaver, as anatomical questions ordinarily must be, is now agreed upon by all gynecologists. The reason is obvious: after death, with the cessation of the circulation, the uterus and neighboring organs lose their tonicity, the muscles of the pelvis become relaxed, the intra-abdominal pressure ceases, and the uterus, obeying the laws of gravitation, falls backward, the corpse being supposed to occupy the usual dorsal decubitus. This is the position usually figured by the anatomists, notably by Henle. Nor can it be admitted that investigations on recently frozen cadavers are fitted to settle this question definitively, as affirmed by some distinguished anatomists. One of the most recent writers upon topographical anatomy, Henke,[3] insists that the retroversion found in the corpse is the normal position in the living woman. He believes that when gynecologists perceive the uterine body in front of the portio vaginalis they feel the firmly-contracted bladder, and in order to make this interpretation of the results of gynecological palpation the more probable he gives a profile view of a female pelvis, with two hands in the act of bimanual palpation, and between the finger-tips bladder and urethra. Well remarks Küstner: "We poor gynecologists, who with our touching fingers grope around in the darkness of inexactness, look up reverently and expectantly to the mother of all medical science, anatomy, and this is the light of the explanation which she affords us." As anatomical investigation in this instance leads us astray, the only other means at our command to solve this problem is observation on the living woman. Now and then, in the performance of laparotomy, the opportunity is afforded us of studying the normal pelvic organs of the female. Ordinarily, however, we must have recourse to our sense of touch to ascertain the position of the uterus in the living woman. And I am convinced that all experienced gynecologists who have thoroughly mastered the art of bimanual palpation so as justly to lay claim to the *tactus eruditus* will agree with me when I assert that this method of examination, a few rare cases excepted,

[1] *N. Y. Medical Journal*, xxi. p. 337, and *Am. Journ. of Obstetrics*, vol. xi. p. 314.

[2] *Am. Journ. of Obst.*, xiii. p. 30.

[3] *Topographische Anatomie des Menschen*, Berlin, 1884, p. 407.

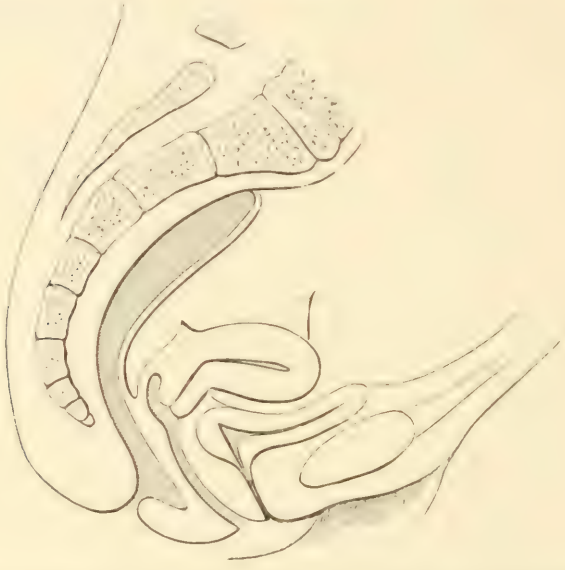
when carefully practised with elimination of all sources of error, is fully competent to determine the position of the uterus in the pelvis. Schultze, and after him Foster, have devised methods to determine with perfect accuracy the position of the uterus in the living woman, for a description of which the reader who is interested in this subject will do well to consult the paper of Dr. Foster to which reference has already been made. Fritsch makes the criticism that, "since the womb is normally movable, we cannot speak of a definite normal position. The entire number of positions of the womb are normal in different physiological conditions of the neighboring organs." This criticism loses its force if we bear in mind that the definition of the normal position includes, as an essential part, a considerable degree of mobility on the part of the uterus and the spontaneous daily occurrence of definite changes in its position to a greater or less degree. Bimanual palpation reveals the fact now that the normal uterus, the bladder being empty and the rectum either empty or moderately filled, is inclined forward, with its fundus behind the symphysis, the os uteri being situated about 2 cm. from the point of the sacrum, and the angle between vagina and cervix being almost a right angle in women who have never been impregnated, while in women who have borne children it is usually more acute. The position of the uterus is, moreover, normally, never quite median, since the anterior surface, turned to the bladder, looks forward and to the right, and consequently the fundus is slightly rotated to the right and the vaginal portion to the left. In a word, the normal position of the uterus when the bladder and rectum are empty is that of anteversio-flexio, the place of flexion being at the junction of cervix with body.

This, which is the usual position, is subjected to physiological changes of quite a marked degree. In the first place, the uterus is under the influence of the intra-abdominal pressure in its variations. The effects of the ordinary respiratory changes of the intra-abdominal pressure are slight, but perceptible, the fundus uteri being depressed upon the bladder and the vaginal portion moving toward the sacrum. This deviation of the vaginal portion can be readily observed in the use of the Sims speculum. When the intra-abdominal pressure is increased the uterus is displaced downward to a considerable extent; but when there is an intermission of this pressure it ascends again, and when the intra-abdominal pressure becomes negative the uterus may even ascend into the abdominal cavity, while the vagina becomes filled with air, as is well seen when the patient is made to assume the knee-chest position and Sims' speculum is introduced.

The uterus is influenced to a much greater extent, as regards its position, by the varying degree of fulness of the bladder, to a less degree by the state of the rectum. The coils of intestine which are found in

Douglas' pouch ordinarily escape into the general peritoneal cavity when the rectum and bladder are distended; but when these organs are empty they lie in the pelvic cavity, forming material to fill up interspaces. As the bladder becomes filled the uterus is slowly elevated and displaced backward, and the farther it recedes the more the intestines are

Fig. 351.



Physiological Position of the Uterus when Bladder and Rectum are empty (after Fritsch).

displaced from the pouch of Douglas, until finally, when the bladder is distended, the uterus lies in juxtaposition with the anterior wall of the rectum: it is both retroposed and retroverted. As the bladder becomes emptied the uterus gradually returns to its former position of anteversio-flexio, the explanation of which is obvious when we consider that, in the first place, the cervix is maintained in a position near the sacrum by the recto-uterine ligaments (ligamenta retractores, Luschka); and secondly, in consequence of its subperitoneal attachment to the bladder at the upper part of the latter, it must follow the collapsing bladder-walls. It is to be borne in mind that when the bladder is evacuated of its contents the walls are brought into apposition in such a manner from above downward that the largest diameter lies in the conjugate axis, the upper surface presents a concavity toward the abdominal cavity, and above this depression lies the anterior wall of the uterine body. A median section of the empty bladder is not globular, but, as Schultze expresses it, is like a saucer or dish. The intra-abdominal pressure is an essential factor in maintaining the normal position of the uterus. When this organ becomes anteverted in

consequence of the evacuation of the contents of the bladder, the posterior surface of the uterus, now the upper, falls under the influence of that pressure, the anteversion is increased, and, when normal flexibility exists, flexion is superadded. The flexion, according to Schultze, is exclusively the effect of intra-abdominal pressure; the contraction of the bladder can only antevert the uterus. The fundus uteri describes an arc which corresponds to an angle of 45° to 60° when the bladder, previously moderately full, is emptied. Normal daily changes in the position of the uterus are produced by the filling and emptying of the rectum. The descending column of fecal matter necessarily displaces the vaginal portion forward, and in doing so places the *retractores* on the stretch. If the bladder is empty and the flexibility of the uterus considerable, the effect is an increase in the degree of flexion; if, on the contrary, the flexibility is slight, the entire uterus is displaced forward. If, however, at the time of the voidance of the contents of the rectum the bladder is full, there is neither space for a marked degree of flexion nor forward displacement, and the uterus is straightened and pushed upward. The influence of the rectum in changing the position of the uterus is normally of short duration, and comes into play at stated intervals, for the portion of the rectum below the retractores is in the greater part of the day almost or quite empty, and only a short time before or during the act of defecation is it distended by the descending column of fecal matter.

After the evacuation of the rectum the uterus is restored to its normal position mainly by the contraction of the recto-uterine ligaments. The attachments of the uterus to its neighboring organs are, however, so yielding that temporarily the cervix can deviate to a decided extent forward and the fundus to a marked degree backward. Accordingly, it will be seen that the uterus undergoes daily excursions of no mean degree, which are to be regarded as physiological so long as they are produced by determinate causes and are of a transient character, and provided the uterus returns to its normal position after their removal.

The movements of the uterus hitherto considered are brought into play by forces generated in the body of the woman herself. It is also important to understand the nature and extent of the passive mobility of the uterus, or, in other words, to know the movements which we have it in our power to communicate to this organ. It is possible, both by means of instruments and by the examining fingers, to impart a variety of such movements. By means of the finger in the vagina we can displace the vaginal portion backward and upward in the elongated vaginal axis to the extent of several centimeters, and, according to the flexibility of the uterus or the reverse, we either force the anteflexed uterus into a condition of anteversion or increase the already existing anteversion. We can also communicate to the uterus the oppo-

site movement by aid of bimanual co-operation, the finger in the vagina drawing the portio vaginalis forward, while the other hand, through the abdominal walls, first elevates and then retroverts the organ. The uterus can also be elevated and depressed.

Other movements, passive in character, of which the entire organ is susceptible, are those of *anteposition* and *retroposition*, by which terms we mean the displacement of the entire organ in the corresponding directions. *Dextroposition* and *sinistroposition* are only possible to a very limited degree in the normal uterus. Again, the vaginal portion may be displaced to the left *per vaginam*, while through the abdominal coverings the fundus is moved to the right, constituting *dextroversion*. Similarly, of course, *sinistroversion* may be produced. Finally, the uterus can be rotated about its longitudinal axis by the sound to the right or left, to a limited extent.

If the uterus oversteps the limits of the normal in any one of the directions in which its daily excursions take place, it is no doubt correct to say that the positions assumed by it at times are anomalous; but if it is able to return spontaneously to its normal position after the transient cause of the abnormal excursion has ceased to operate, we could not term the latter a displacement in a clinical sense. In the language of Schultze,[1] "Changes in the position of the uterus only become displacements in the clinical sense when they are more or less *stable*. Limitation or hindrance of the normal movements of the uterus is a main characteristic of its displacements." At first thought this statement may seem incompatible with palpable facts, because it is well known that a dislocated uterus may remain abnormally movable and execute at times abnormally extensive movements: though this be true, nevertheless it will be observed that the definite normal movements of the uterus are obstructed or are completely wanting. Let us now study the various displacements in detail.

Anteversion.

Etiology and Pathological Anatomy.—When the uterus is so infiltrated, thickened, and rigid as a result of inflammation that the physiological angle of flexion, corresponding to the inner os uteri, is diminished or abolished, so that the uterine axis is straightened, we have a pathological change before us constituting *anteversion*. To the definition of anteversion should be added, according to Fritsch, the further postulate of a perimetric process which fixes the lower end above and the upper end below. The uterine parenchyma and the adjacent peritoneum will consequently show pathological changes. In anteversion we may therefore always expect to find peri- or parametri-

[1] *Die Path. u. Therapie der Lageveränderungen der Gebärmutter.*

tis and metritis, usually in a chronic form. The entire uterus, especially the transition of the cervix into the body, is abnormally swollen, thickened, and rigid. The body occupies nearly a normal position, being, however, pressed downward upon the bladder to a greater degree than is usually the case; but the cervix deviates to such an extent from the normal direction that the external os uteri looks directly backward toward the hollow of the sacrum.

Anteversion can be produced not only by a posterior fixation, but also by an anterior. Tube and ovary of either side can be attached by perimetric adhesions to the front part of the pelvis, and these may be so firm that the fundus cannot be lifted even by the application of considerable force. Fritsch does not believe that an attachment directly in front ever takes place, on account of the intervention of the bladder between the symphysis and the uterus. If, on the other hand, the connections of the uterus with its neighboring parts are relaxed and yielding, considerable changes can take place in the position of the stiff organ according to circumstances. When the bladder is empty and there is an increase of the intra-abdominal pressure, the body descends lower, and can be felt immediately above the anterior vaginal wall to its full extent, while the os uteri looks upward and backward toward the promontorium. As to how the anteverted uterus will behave when the bladder is full or distended will depend on whether there is fixation or not. If there are adhesions which fix the uterus, it will persist in the anteverted position no matter how full the bladder becomes, but if the uterus is movable, as the bladder becomes filled it will be lifted up so as to lie in the pelvic axis in its rigid form. When the bladder is detached from its connection with the cervix, it will not alter the anteverted position of the uterus, as in filling it rises between fundus and symphysis.

The causes potent in the production of anteversion are such as are effective in evoking metritis and para- or perimetritis. Especially worthy of mention are—defective involution in the puerperal state, notably after abortions; lacerations of the cervix, and more particularly those involving the parametrium; and, finally, acute and chronic inflammatory conditions attended with connective-tissue hyperplasia. Corresponding to its etiology, the uterus is enlarged, thickened, and either engorged with blood, and so rendered rigid, or else unalterably stiffened by contraction of the connective tissue in the parenchyma. These conditions are frequently associated with parametritis posterior, as the result of which shortening and rigidity of the recto-uterine ligaments take place, and thus the anteversion is increased in degree and made permanent. The frequent complication of perimetritis after what has been said before need scarce be mentioned again.

Symptoms and Course.—As anteversion is a consequence or

accompaniment of metritis, parametritis, or perimetritis, it needs no extended argument to show that the symptoms are called forth by these complicating affections. Schroeder directed attention to a group of symptoms which are not usually attributed to anteversion, but which are undoubtedly dependent upon this condition, and owe their origin to a condition of things the reverse of what are usually found here. According to this author, if the abnormally heavy uterus is not maintained in a fixed position by the relaxed ligaments, it changes its position not only in obedience to the varying degree of fulness of the bladder, but also with each changing posture of the body. The sensation of movement on the part of the sensitive uterus calls forth very disagreeable feelings, and is a source of constant annoyance to the patient. If the uterus, however, is fixed in the anteverted position, it produces disturbances in the functions of the bladder which manifest themselves usually in frequent or difficult micturition.

Important symptoms are the anomalies of menstruation, depending not only on the inflammatory condition of the uterus, but also on its altered position. The metritis or perimetritis may undergo recrudescence during menstruation, and hence the anteverted uterus can pour forth large quantities of blood at this time: in a word, menorrhagia is a symptom by no means infrequent. Dr. Thomas[1] mentions the fact that, in exceptional cases, locomotion is affected by this condition, and he further states that four patients who thus suffered were relieved by the use of an anteversion pessary in each case. These cases doubtless came under the category above mentioned first described by Schroeder, in which the anteverted uterus is movable and discomfort is evoked when the organ is displaced by the movements of the patient. When the acute or subacute inflammations have been relieved the patient may feel perfectly well, although the abnormal position still persists; the bladder becomes accustomed to the new form of dilatation to which it is necessitated by its relations, as in pregnancy.

Diagnosis.—The diagnosis offers no difficulty of any moment when bimanual palpation is called into requisition. The portio vaginalis is found directed behind and above, the body lies on the anterior vaginal wall, and the fundus is directed toward the symphysis, while the angle of normal flexion no longer exists. There is no necessity for the use of the sound for diagnostic purposes. Hart and Barbour[2] call attention to the difficulty in differential diagnosis "when there has been inflammatory deposit in front of and around the cervix simulating the anteverted fundus. In these cases the combined examination is difficult from existing inflammation. The examination with one finger in the rectum enables us in such cases to ascertain that the fundus uteri is at least not lying to the back."

[1] *Diseases of Women*, p. 408.

[2] *Manual of Gynecology*, 3d ed., p. 341.

TREATMENT.—Since anteversion is not a disease in itself, treatment to be rational must be directed to the morbid process producing it. All the varied forms of anteversion pessaries, upon the construction of which so much ingenuity has been expended, are unnecessary and superfluous —nay, are often injurious—and the hypothesis which suggests their employment is incorrect—*i. e.* that the fundus can be acted on through the anterior vaginal wall. When the inflammatory complications have been removed to such a degree that they exhibit no more signs of activity, and the annoyances from which the patient suffers are due to dragging or perimetric adhesions in walking, or when the connections of the anteverted uterus are relaxed,—under these circumstances an elastic ring of soft rubber or the Emmet pessary with very slight curve will afford relief as a rule, the explanation of the beneficial action of such a pessary being that the bar, lying in the posterior fornix vaginæ, prevents the deviation of the portio backward and maintains it in a more erect position; consequently, as the body is rigidly united with the cervix, the whole organ is hindered from occupying the extreme position of anteversion, and at the same time is restrained from frequent and excessive movements. Having regard to etiology, the treatment must therefore be mainly directed to subduing the irritative conditions of the uterus and its vicinity. Hence hot-water vaginal douches are indicated. The use of the wet pack to the hypogastrium and sitz-baths is also attended with good results. Scarifications of the portio repeated from time to time are very useful in relieving the hyperæmia. The application of iodine to the portio and vicinity is certainly beneficial in its effect, however we may explain its mode of efficacy. The repeated use of borated cotton saturated with glycerin and inserted in the posterior fornix vaginæ is indicated.

For the menorrhagia which is so often attendant upon anteversion hydrastis is a most excellent drug. The use of ergot, continued for some time, has been praised by many. It is well to bear in mind, however, the excellent remarks of Hart and Barbour in regard to the treatment of anteversion. "It is improbable," they observe, "that the mere anteversion of the uterus causes any distress. The ordinary statement, that the uterus when anteverted presses on the bladder, is open to the fatal criticism that the uterus always presses on the bladder, while, so far as mere weight is concerned, there are, in the majority of cases, no special symptoms referable to the anteversion of early pregnancy." This reasoning from analogy is not altogether favorable to their argument when the facts are carefully weighed, for it cannot be denied that urinary disturbances are nearly always present in the early part of pregnancy. It is true, however, that it is not the *anteversion*, but the *fixation*, of the anteverted uterus which causes the chief annoyance by interfering with the dilatation of the bladder.

It was to relieve the urinary disturbance in a patient that Dr. Sims was led to perform his operation on the anterior vaginal wall with the view of shortening this wall and at the same time elevating the uterus. This patient suffered from anteversion caused by a tumor situated in the fundus. Finding that the uterus could be lifted to its normal position by seizing the anterior lip of the os uteri and drawing the cervix down toward the urethra, the operation suggested itself to shorten the elongated anterior vaginal wall and attach the cervix to it. To that end two semilunar portions a half inch wide were cut out of the vaginal mucous membrane, one of them in juxtaposition with the cervix, the other an inch and a half in front of it, and the edges of the wounds were brought together by means of silver sutures, as in the operation for vesico-vaginal fistula. The sutures were removed after ten or twelve days, and the wounded surfaces were found united. The patient kept her bed a week longer. Says Sims: "The uterus was kept in its proper position by this wall constructed of vaginal tissue just as well as before by the tenaculum, and, fortunately, the patient was entirely relieved of the morbid symptoms of which she had complained so long before the operation." Unfortunately, we will not often find such a condition of things in anteversion as will indicate the performance of this operation of Sims; yet it is well to bear it in mind.

There is one operative procedure which I can praise in the highest terms from clinical experience: it is the amputation of the swollen portio vaginalis after the method devised by Schroeder, which consists in excising a wedge-shaped piece from the anterior and posterior lip, after first dividing the portio bilaterally down to the vaginal junction. As a consequence, the portio assumes a different position, and the tormenting symptoms are relieved because the chronic metritis is cured.

Anteflexion.

Etiology and Pathological Anatomy.—There is no portion of the entire domain of gynecology which is in so unsettled a state in regard to its pathological significance as that which embraces the subject of anteflexion, and none as to which, it may be added, such diverse views are held. Hart and Barbour[1] give as their definition the following: "*Anteflexion* is merely an exaggeration of the normal condition." But, as we have seen, the normal uterus lies in a position of anteversion and anteflexion: it cannot be much more anteflexed than we find it under normal conditions. What better proof can be offered of the confusion which prevails here among writers than to refer to the paper of Vedeler,[2] in which the author states that among 3012 women examined by him he found 66 per cent. affected with *antever-*

[1] *Loc. cit.*, p. 330.

[2] *Archiv für Gynäkologie*, Bd. xix. p. 295.

sions and *anteflexions*, and only 15 per cent. in whom normal positions could be demonstrated? After discussing the subject at some length, he attains to the conclusion that the position designated as the *pathological* is the *normal*, and the *normal*, so called, is the *abnormal* position of the uterus. Most lame and impotent conclusion!

Küstner[1] maintains that the terms anteversion and anteflexion as pathological conditions should entirely disappear from our terminology. We are not yet ready for so radical an innovation, for it seems to me that their clinical features are too well characterized, and convenience alone should justify the retention of the terms. The studies of Schultze are here epoch-making, and the theme, thanks to him, has been illumined by exact scientific observation to such a degree that our comprehension of it has been vastly facilitated.

FIG. 352.

Anteflexion produced by Cicatrization of Utero-sacral Ligaments (Schultze).

In order that anteflexion become pathological it is a necessary antecedent that there should be rigidity at the point of flexion, which must be an acute angle, or posterior fixation; in other words there must be metritis or infarction, or parametritis posterior, or parametritis chronica atrophicans, or perimetritis. The causes which make the flexion of the uterus permanent are therefore either in the organ itself or operate on it from without. When metritis attacks the uterus fixed in anteflexion, the angle of flexion, which up to that time had been variable, becomes fixed. Again, partial shrinking of one wall and an increase of volume of the other can lead to a curvation or flexion of the organ over the shorter surface. Tumors with broad bases having their site in the posterior wall, as myomata or adenomata, can make rigid anteflexion. Very much oftener the causes which are potent in the production of permanent anteflexion lie outside of the uterus. Such causes as ovarian tumors, anterior peritoneal adhesions, shrinking of the ligamenta rotunda, can hinder the body of the uterus from making its normal

[1] *Die Normale u. Path. Lagen u. Bewey. des Uterus*, p. 44.

excursions backward as the bladder fills. The most frequent cause by far, however, of pathological anteflexion is parametritis posterior or parametritis chronica atrophica (Freund). To E. Martin we owe the first recognition of the clinical fact that shortening of the sacro-uterine ligaments is a frequent cause of pathological anteflexion.[1] The most frequent causes of parametritis posterior are of non-puerperal origin, though often dating their origin from the puerperium. The puerperal parametritis posterior is due usually to ruptures of the perineum or lacerations of the cervix, and consequent septic infection. The exudation may be slight, the acute stage short, and the local pains not very marked. Such an inflammation is often—I ought rather to say is as a rule—overlooked. A typical case of puerperal parametritis came under my observation in May last, which I saw in consultation with Dr. S. B. Allen of this city, and which I may mention to show how little distinctive the symptoms usually are. Previous to this date Dr. Allen had curetted the endometrium and used intra-uterine injections on account of symptoms indicative, as he thought, of septic infection from retained remnants of placenta or decidual membranes: this occurred several days after the confinement. The symptoms became more favorable under this treatment, but after the lapse of several days there was a return of threatening symptoms. These consisted chiefly of an elevation of temperature, a slight degree of pain in the right inguinal region, and an increased frequency of pulse. Examination *per vaginam* revealed the existence of recent laceration of the cervix on the right side, and a parametritis could be demonstrated, involving the right recto-uterine ligament especially, which was thickened and tender upon pressure. I have had repeated opportunity of observing like cases. The use of the ice-bag to the abdomen soon brought about a decline of this inflammation.

In the unmarried, and in married women who have remained sterile, the parametric process is generally subacute or chronic from the beginning. This form may be caused by the frequent traction to which the recto-uterine ligaments are subjected in the passage of voluminous scybalous masses in obstinate constipation, to infection from the rectum in consequence of fissures, or to extension to the parametrium of endometric processes by reason of stagnation of catarrhal secretions.

The acute form of parametritis of non-puerperal origin is either traumatic and septic or of gonorrhœal origin. In the case of gonorrhœal infection the fixation is, however, not so often caused by a parametric as by a perimetric process, the disease extending from the mucous membrane of the cervix to the tube. The infectious matter then flows out of the abdominal end of the tube and attains to Douglas' pouch, the deepest portion of the peritoneal cavity, and leads here to inflammation

[1] *Niegungen und Beugungen*, 1866 u. 1870.

and adhesion of the posterior wall of the uterus to the opposite peritoneum, and thence shortening of the recto-uterine ligaments. Pathological anteflexion, thus characterized, is one of the most frequent diseases found among women. By many writers it is termed *acquired anteflexion*, as distinguished from *congenital anteflexion*. Schultze objects to the term *congenital anteflexion*, because none of the conditions belonging to this anteflexion as observed in the mature woman depend on an anomaly already existing at the time of birth. He prefers the term *puerile anteflexion*. It constitutes an arrest of development, in which the uterus exhibits in its conformation a type proper to the child. The characteristic features of puerile anteflexion are shortness of the vagina, especially of the anterior wall, the slender conoidal form of the vaginal portion, the os being often very small, a remarkably long *portio intermedia*, the position of the cervix in the axis of the vagina, and the excessive flexibility at the transition of the cervix into the body of the uterus, in consequence of which anteflexion with a very acute angle is produced. Transitions can take place from the mature normally-developed virgin uterus, on the one hand, to an arrest of development at the stage of childish formation. If a uterus the seat of puerile anteflexion is attacked by parametritis posterior or a perimetric process, by which the upper cervical section is carried upward and backward, the anteflexion will exhibit an especially acute angle. Such a uterus, when it loses its flexion and flexibility on account of metritis, will not assume an anteverted position, but, on the contrary, will become retroverted, because the vaginal portion, by reason of its insertion and length, compels the cervix to lie in the axis of the vagina, and the body, not being able to bend on the cervix, must accommodate its position to that of the latter, and thence must lie in the position of retroversion. Fritsch throws out the conjecture[1] that there may be cases in which the short folds of Douglas are congenital, and the anteflexion caused in this way. Graily Hewitt, whose writings on flexions of the uterus are characterized by earnestness of conviction and acuteness of reasoning, if not of observation, insists that in the etiology of flexions *softness* of the uterus is a powerful predisposing cause. He is convinced that it is a factor of the extremest importance in bringing about anteflexion and version. It does play its part in certain flexions, notably in retroflexions, but the importance attached to it as an etiological factor by Hewitt cannot be sustained by clinical facts. Dr. Emmet,[2] as is well known, distinguishes between flexion of the cervix and flexion of the body, the first being the more frequent. "Flexures of the cervix," he remarks, "have their origin about puberty, or shortly afterward, by the balance being lost between

[1] *Handbuch der Frauenkrankheiten Lageveränderungen der Gebärm.*, p. 29.

[2] *Principles and Practice of Gynecology*, 3d ed., p. 331.

the relative growth of the body and cervix. From the earliest development of the uterus, as a rule, until pregnancy, some degree of anteversion exists. With the uterus in this position the neck cannot be developed to its full length without forcing the cervix forward in the axis of the vagina, in the direction offering the least resistance. As the body of the uterus lies forward, the cervix must become bent upon itself at or near the vaginal junction, and thus the flexure is formed." The views here advocated by this eminent surgeon are not at all in harmony with my clinical observations. In a few cases, either by original malformation or by acquired deformity, the vaginal portion may be placed at an angle with the upper part of the cervix, and now and then, as a great rarity, a bend may be found in the body; but, as we have repeatedly said, the typical place at which the flexion is found, in ante- as well as retroflexion, is at the junction of the body with the cervix, the point at which the uterus is fixed by the folds of Douglas behind, and where the peritoneum of the anterior wall passes over to the bladder.

Symptoms.—The symptoms of pathological anteflexion are chiefly those produced by the complications; especially are they referable to the parametritis posterior or the perimetritis.

It is unnecessary to dwell upon the symptoms dependent on the complicating metritis or endometritis catarrhalis, but the parametritis, as Schultze correctly insists, is an essential and characteristic feature of the clinical picture of pathological anteflexion. In the acute form, when it occurs in the puerperal period, the single symptom may be an elevation of the temperature or acceleration of the pulse, and without an accurate exploration of the uterus and its vicinity by the combined examination a true diagnosis is impossible. The rectum gapes widely, because the surrounding parts are rigid from the exudation, and do not collapse when the former is empty. In the cicatricial stage the folds of Douglas shrink and draw the uterus up toward the sacrum. The rectal space is encroached upon now by the approximation of the folds, and the passage of fecal matter gives rise to pain—nay, at times to recrudescence of the inflammatory process. In the chronic stage, or in that form which is chronic from the beginning, the complaints of the patient are referable chiefly to the rectum. In some cases there is severe pain just before the evacuation of the rectum; in others, the pain is not so intense, but a most disagreeable sensation in the pelvis after a stool is the subject of complaint. When the stenosis is considerable in degree solid fecal masses find difficulty in effecting a passage, and at times diarrhœa is observed of an obstinate character.

Disturbances of the functions of the bladder are frequently noticed in the disease under discussion. Schultze refers them to the parametritis posterior, and believes they are in part dependent on collateral

disturbances in the circulation and innervation of the bladder, but also in part are due to the traction which the posterior vesical wall suffers on account of the strong retroposition of the cervix, and to a very limited extent are they dependent on the pressure of the corpus uteri on the upper wall of the bladder. Emmet's[1] studies on pelvic cellulitis have led him to identical views. "One of the most distressing symptoms to relieve," he remarks, "is the irritation of, and the constant desire to empty, the bladder which sometimes exists after the more acute symptoms have passed away. Pelvic inflammation at any point may cause this disturbance, but it is more marked when it is situated in the utero-sacral ligaments." The reader will find his account in reading the remainder of this author's suggestive observations on this theme in his invaluable work, to which reference has been made. The bladder annoyances in question are, I believe, dependent on several causes, and besides those mentioned another is the interference with the normal expansion of the bladder.

There are two most important symptoms associated with pathological anteflexion which have led to animated scientific discussions, and their importance is enhanced by the circumstance that the principles of treatment must be largely dependent on the understanding we have of them: they are *dysmenorrhœa* and *sterility*. After the classification of the older medicine of dysmenorrhœa into various kinds was overthrown as scientifically inexact, the mechanical theory of dysmenorrhœa was generally adopted under the influence of the teachings of Sims. The doctrines enunciated by him are as follows: "I regard it as an axiom that no dysmenorrhœa, in the proper sense of the term, can exist when the canal of the uterine neck is straight and sufficiently wide to permit the escape of the menstrual blood; in other words, that the condition can only then occur when some sort of mechanical obstruction exists at some point between the inner and external os uteri or in the entire length of the cervical canal which obstructs the free outflow of the menstrual blood." The late Karl Schroeder was a most earnest and brilliant advocate of the mechanical theory, and his explanation of the phenomena was the following: "The blood is effused into the uterine cavity, but can escape with difficulty on account of the flexion at the internal os, so that repeated contractions of the muscular tissue of the uterus are necessary in order to force it through the narrowed place. These contractions are perceived as spasmodic pains (uterine colics). They appear at each ensuing menstruation, although their intensity may exhibit differences. Chronic inflammatory conditions are frequently produced by the constantly recurring irritation." Scanzoni combated the mechanical explanation with masterly dialectic skill, and endeavored to show that flexions of the uterus in themselves only attain

[1] *Loc. cit.*, 3d ed., p. 223.

to more or less significance and are followed by decided disadvantages when associated with other diseases of the uterus and its annexa.

It is, however, undoubtedly the great merit of Schultze to have demonstrated in a scientific and exact manner that the ground on which the mechanical theory is defended is untenable—a certain class of cases excepted, to be mentioned later on—and that the explanation must be sought in the associate metritis. He showed that during the existence of the most intense dysmenorrhœal pains the sound could be repeatedly carried to the fundus without being followed by a drop of blood, and without a drop of blood leaving the uterus for hours—nay, for days—afterward; although, demonstrably, the passage is free, at the time when the pains are at their worst there is no effused blood in the uterine cavity. Moreover, it is a matter of not infrequent observation that an anteflexed uterus, complicated by parametritis posterior, which during the continuance of a metritis shows characteristic dysmenorrhœa, will menstruate without pains after the metritis has been removed, although its form and position have not changed, while the dysmenorrhœa reappears so soon as exacerbation of the metritis has taken place. The same dysmenorrhœa is observed further in a uterus not flexed, the seat of an inflammation either acute or chronic. Again, by analogical reasoning we arrive at the same result from observations made with regard to the anteverted uterus. An anteverted uterus, rigid by reason of the complicating metritis, and fixed in the anteverted position by parametritis posterior, exhibits the most exquisite form of dysmenorrhœa. If the metritis disappears under a judicious mode of treatment, the flexibility of the uterus is restored, and, since the folds of Douglas are shortened by parametritis posterior, a more or less permanent flexion is developed. Notwithstanding the simultaneously appearing and increasing flexion, the dysmenorrhœa disappears in proportion as the flexibility and the flexion increase. Again, the mechanical theory fails to explain the clinical phenomena in dysmenorrhœa, according to Schultze, for the pains begin generally before—sometimes long before—the menstrual flow, and persist with intensity while the flow is scanty, and as soon as the blood becomes more profuse in quantity the pains intermit or cease. But when a mechanical obstacle exists, hindering the escape of the effused blood, which must be overcome by painful, intense contractions, from *a-priori* considerations we would naturally suppose that the more copious the discharge the stronger and more painful must be the contractions to force it through the narrowed place. Consequently, the explanation of the dysmenorrhœa as usually observed in pathological anteflexion is that it should be attributed to the transient flushing of the uterine vessels preceding the menstrual flow. The appearance of a copious discharge of blood relieves the distended vessels and diminishes the contractions and their pains. The mechanical theory, how-

ever, must be invoked to explain the dysmenorrhœa observed in stenosis of the external os or internal os, especially in cases of puerile anteflexion, in which the former is by no means rarely seen, as well as exceeding narrowness of the cervical canal. Stenosis of the internal os is by no means as frequent as has been usually stated. It is a correct clinical observation that pathological anteflexion is often accompanied by *sterility*. It has been usual to attribute the sterility to the flexion: it is more in accordance with clinical facts to assume that it is due to the inflammatory processes associated with the anteflexion. Formerly—and it is not very long since—every anteflexion was considered as pathological, and, as the association was not unusual, the sterility was regarded as due to the anteflexion *per se*. It is, however, more rational to attribute it to the endometritis, oöphoritis, and perimetritis which so often complicate anteflexion, and which hinder conception for reasons not far to find. If these are removed, and if the perimetritis has left behind no permanent pathological changes, conception may ensue notwithstanding the existence of parametric cicatricial tissue or permanent anteflexion.

The DIAGNOSIS of pathological anteflexion cannot be made from the degree of the angle, for this is a matter of indifference, provided the flexibility of the organ is normal or increased; nor can the diagnosis be made from the symptoms, for they can be produced by other conditions. It must depend alone on the demonstration of the *stability of the flexion*. This demonstration can be elicited by the recognition of the permanence of the angle of flexion as the result of bimanual palpation; or by the establishment of the fact that the anteflexion persists even when the bladder is distended; or, *thirdly*, by the discovery that the folds of Douglas are shortened or stiffened. The use of the sound to assist in making the diagnosis can, as a rule, be dispensed with, and only where there are special indications is its use to be recommended. We can obtain all the information necessary for a diagnosis, rare cases excepted, by combined vaginal or rectal and abdominal examination. We can form an idea of the degree of flexibility of the uterus by fixing the portio vaginalis or cervix with one or two fingers of one hand *per vaginam*, while with the other hand the fundus is grasped through the abdominal walls and an effort is made to approximate or extend these parts. At the same time we can ascertain if there is fixation of the organ behind or adhesions in front. The posterior fixation of the cervix in consequence of shortening of one or both of the *retractores* is recognized by the high position of the vaginal portion, by its approximation to the posterior pelvic walls, by its forward direction, and by the diminished or suspended mobility of the uterus. In the *congenital* or *puerile form* of anteflexion, in consequence of the fact that the vaginal portion lies in the axis of the vagina, and especially when there is

posterior fixation, the error can be easily made of mistaking this condition for a retroversion. By rectal exploration we gain information of the condition of the folds of Douglas, their prominence, thickness, narrowness, or painfulness.

Treatment.—If the pathogenetic views above enunciated are well grounded, then it must of necessity follow that the object of our therapeutic endeavors in pathological anteflexion should be the removal of the parametritis posterior or perimetritis and the results. It is not intended by this statement to deny the existence of other causes of pathological anteflexion, as a metritis which has made the flexion constant or a superincumbent tumor which hinders the normal excursion of the uterus; but the parametritis and perimetritis are factors in the production of this morbid condition chiefly predominant. I am fully aware of the fact that the pathological significance of parametritis posterior has been called in question, but my clinical observations, carefully conducted with an earnest desire to exclude all sources of error, have convinced me that the doctrines enunciated by Schultze are correct. "It is certainly suspicious," says Fritsch, "to construct diseases for the explanation of facts. Schroeder insists rightly that parametritis posterior is never found nor seen at the autopsy-table." But, as this distinguished writer goes on to remark, "all these objections are not at all fitted to shake the actual correctness of the views of Schultze. For patients do not die of anteflexion, and if death appears, age, intercurrent diseases, or other conditions have so operated that a substratum of parametritis posterior will not be found." I find, as a confirmation of the opinion I expressed, that clinical observers are more and more inclined to recognize the truth of these views, and even Schroeder, who at first opposed Schultze, in successive editions of his work came over more and more to the ground occupied by Schultze. Gynecological pathological anatomy is here far behind clinical investigation, and until it acquires larger proportions it will be an act of becoming modesty for its cultivators to refrain from invocating its authority.

During the continuance of parametritis posterior it is a matter of paramount importance to regulate the bowels in order to protect the retractors from injury, to which they are liable from the passage of large stools, or, on the other hand, from diarrhœa accompanied by straining efforts. To be avoided also is *coitus*, and, again, our efforts must have in view the limitation of abdominal pressure; hence all violent exertion is contraindicated. Just before menstruation, when the uterus is supersensitive, the dysmenorrhœa can be moderated by a suitable abstraction of blood from the portio. Deep scarifications I prefer—because the quantity of blood withdrawn and its effects can be carefully noted—to the application of leeches. Others give the decided

preference to leeches on account of the after-bleeding. If scarifications are decided upon, they are best made with the patient in Sims' position, the portio being exposed by his speculum; the lips of the os are everted, and one or two incisions are made in its mucous membrane. It need scarce be insisted upon that strict antiseptic precautions must be enforced. The vaginal portion and vagina must be, beforehand, thoroughly cleansed by a solution of carbolic acid or other antiseptic, and after the proper quantity of blood has been abstracted the incisions must be irrigated with a 2 or 3 per cent. solution of carbolic acid. These scarifications are to be repeated every three or four weeks. In the application of leeches the vagina must be carefully disinfected beforehand. For the mode of their application the reader who is interested would do well to consult Mundé's excellent work on *Minor Surgical Gynecology*. It is especially important to take measures to prevent the leech from gaining admission into the uterus. If this should happen, grave symptoms might supervene consisting of uterine colic, intense hemorrhages, and general convulsive phenomena. Scanzoni and others have noticed acute eruptions of the skin after their application. I have observed in one case, after the use of one or two leeches, a most alarming hemorrhage ensue. Moreover, in some cases, the suction of the leech produces such an irritation that the opposite effect to that intended is produced, and there is an increased fluxion of blood to the uterus.

Since *chlorosis* is so frequently observed in women who have pathological anteflexion, it goes without saying that it is all important to improve the condition of the blood and general nutrition. When we send such patients to watering-places where there are medicinal springs, we should always select those waters for the patients to drink which favor reconstructive metamorphosis. In the same way, the drugs exhibited should be chosen with that view.

An essential factor in maintaining the parametritis posterior is the uterine catarrh. When such a catarrh is the result of gonorrhœal infection its causal relation to the complicating parametritis or perimetritis is plain. Schultze, however, maintains that even in the case of simple catarrh, in consequence of stagnation of the secretion, parametritis may be developed. I can confirm the excellent effect of washing out the uterine cavity with a solution of carbolic acid after a preliminary dilatation with aseptic laminaria tents, followed by steel dilators, as recommended by Schultze, not only in relieving the uterine catarrh, but also in causing absorption of the parametric exudation. The cervical canal remains afterward wide enough to allow the free escape of the secretion; and if there is a return of the catarrh, there is not so much danger of a recrudescence of the parametritis. If the parametritis posterior has existed for a comparatively short time, the

uterus may regain its normal position and mobility after the subsidence of all inflammatory symptoms.

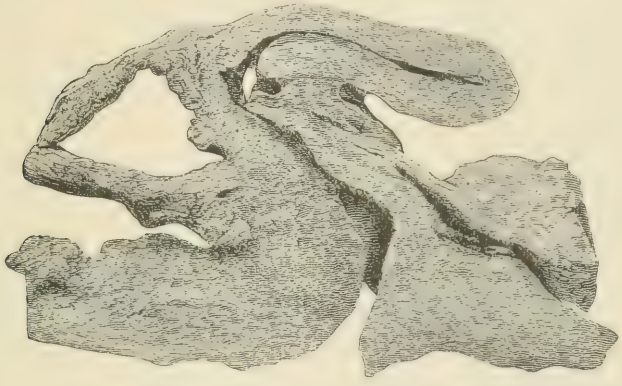
In the more chronic forms of this parametritis, after some years the retractores remain shorter than normal, but are extensible, and no pain is complained of on the part of the patient when the uterus is pulled downward toward the vulva. On bimanual palpation we find in these cases of parametric shortening of the retractores, in which all inflammatory symptoms have disappeared, that the cervix is drawn upward and backward—that there is still anteflexion, and there is more or less torsion. Such women may menstruate without pain, and conceive, and hence there is no indication to correct the position of the uterus. In this class of cases now under discussion, in which all inflammatory complications no longer exist, but in which there is dysmenorrhœa complained of or in which sterility is a symptom, the question may be raised as to the desirability of the use of the intra-uterine stem-pessary or not. The subject is a very extensive one, and the reader cannot do better than to consult Mundé's work already referred to for information in regard to the dangers incident to their employment, the precautions to be observed, mode of introduction, etc. For my own part, I am of the decided conviction that the good to be obtained by the use of intra-uterine stem-pessaries is not of so positive a kind as to outweigh the dangers incident to them; and, moreover—and this is the main thing—the same effect can be produced by the employment of dilating sounds in a way entirely devoid of all dangerous consequences. It ought not to be left out of consideration, it may be said in passing, that the patient wearing an intra-uterine pessary is at any moment liable to septic infection, as it is impossible to keep the pessary in an aseptic condition, and it may readily cause slight wounds. The introduction of sounds—steel I prefer—gradually increasing in thickness so as to dilate thoroughly the cervical canal and the internal os, will, when repeated sufficiently often, relieve the dysmenorrhœa, as a rule, and often the sterility. The object is not to straighten the flexion, as is usually taught, for when we have brought the uterus to the condition of anteversion or retroversion we have certainly not produced a normal position. On the contrary, the good effects of the sound are owing to the free escape of the secretions and to the fact that the uterine mucous membrane is altered for the better, so that the catarrh declines.

Retroversion and Retroflexion.

Definition.—*Retroversion* may be defined as the permanent dislocation backward of the fundus uteri when the form of the uterus is such that axis of body and axis of cervix are identical. *Retroflexion* denotes the permanent backward dislocation of the fundus uteri, with

simultaneous flexion of the uterus over the posterior surface. As a rare combination we sometimes find *retroversion* with *anteflexion*. Anteversion and retroflexion can also coexist. I agree with Schultze in the opinion he expresses that it would be useful to define retroversions and retroflexions according to different degrees if all authors defined these degrees alike. As this is not the case, the designation according to degrees is not to be commended, but our understanding of the condition is facilitated by mentioning the vertebra to which the

Fig. 353.



Retroflexion of the Uterus (after Winckel).

fundus corresponds. The backward-lying fundus can correspond to the last lumbar vertebra, to each of the sacral vertebræ, or to the coccyx. The uterus whose axis is horizontal when the woman is standing is very much retroverted or retroflexed, as the case may be.

Etiology and Anatomy.—Retroversion and retroflexion may be studied together, as the retroversion is usually a transitory condition, and the retroflexion originates from it. It must not be understood, however, that every retroflexion has retroversion as the necessary antecedent. The permanent form of retroversion is retained, it must be added, when the uterus is abnormally rigid, consequently when the same conditions obtain as are found in anteversion. Retroversion and retroflexion may coexist. Retroversio-flexio may originate in an acute manner, even in the unimpregnated uterus. Any cause which evokes intensification of the intra-abdominal pressure may give rise to it, such as lifting a heavy object, violent efforts at emesis, a blow on the abdomen, a fall in which the sacrum receives the chief shock of the injury. A necessary condition for the production of a backward displacement of the uterus under these circumstances is a full bladder. From a medico-legal point of view, it is well to bear in mind the possibility of an acute origin of this anomaly from such causes as those just enumerated. Usually, however, the retroversio-flexio is evoked by causes of

a chronic character. I am convinced, from careful clinical study, that the opinion which is shared by the preponderating majority of gynecologists that retroflexio is rare in the virgin, and that we must seek the causes of the origin of nearly all cases of retroflexio in the puerperal state, is not correct. My views are in entire harmony with those of Küstner[1] when he says: "A much larger quota of retroflexions which are observed date, not from the puerperal state, but had already originated before the first pregnancy, and only re-established themselves in each instance in the puerperium because the attachments of the uterus were in the beginning relaxed; that is, a far greater number of retroflexions than has been hitherto assumed are affections carried over into the sexual life from the time of puberty and puerility." Let us now, with the aid of the exact and rigidly scientific inductions made by Schultze, and more lately by Küstner, seek to elicit the factors potent in the production of this anomaly.

The first cause which invites scrutiny is an arrest of development. As we saw in studying the subject of anteflexion, the peculiarity of this defective development consists in an abnormally long portio intermedia and short vagina, and especially a short anterior vaginal wall. When the bladder is full, such a uterus must lie in the axis of the vagina, and instead of a retropositio taking place, as in normal relations, a retroversio is caused. If such a uterus loses its flexibility in consequence of an inflammation or other cause, such a retroversio becomes permanent. In old women a backward displacement is met with at times, the cause of which is doubtless the short vagina consequent upon senile retrograde metamorphosis. The most frequent anatomical cause, however, giving rise to retroflexions is a relaxed condition of the ligaments maintaining the uterus in its normal position, especially of the utero-sacral ligaments, or, as Luschka calls this muscular apparatus, the musculus retractor uteri. As we shall see farther on, a morbid condition of one or the other of the broad ligaments is also important in bringing about this anomaly. The anatomist Luschka[2] described the musculus retractor as follows: "The folds of Douglas enclose an organic muscular tissue which, as a roundish flat bundle, runs in the interior of the free edge beside the rectum up to the neighborhood of the second sacral vertebra. Into its formation enter not only a certain sum of fibrous cells of the uterus, but the upper end of the vagina adds a certain contingent. The fleshy bundles of the two sides coalesce in these places to a girdle concave toward the rectum, which appears externally as that elevation which unites the anterior ends of the folds of Douglas. . . . . If we fix our attention upon this entire arrangement in regard to its functional significance, it can scarcely appear doubtful that it is fitted to determine and secure the normal

[1] *Loc. cit.*, p. 84.

[2] *Die Anatomie des Mensch. Beckens*, p. 360.

position of the lower end of the uterus, in conformity with which it might be suitably called musculus retractor uteri." Luschka regarded the whole apparatus as constituting one muscle, but writers generally regard it as composed of two muscles. We have followed the general usage in speaking of them as *retractores*. Küstner[1] has subjected the folds of Douglas to careful microscopic investigation, and insists that they contain extraordinarily weak and few bundles of smooth muscular fibres. "But," he continues, "if we go about 1 cm. laterally from the free edge of Douglas' fold, we meet with dense bundles of muscular parts that are readily perceptible to the naked eye. The arrangement is in the form of a flat bundle running along beneath the peritoneal investment. If we were to estimate the power in its totality, we should say it attained to almost the strength of the ligamentum rotundum uteri. *Before*, this muscular apparatus goes over into the muscular tissue of the uterus and the vagina; behind, into the rectum and past the rectum up to the periosteum of the sacrum." For the practical gynecologist it is sufficient to know of the existence of this muscular apparatus and its important functions, and whether it is in the folds of Douglas or just outside may be left to further anatomical study and investigation. "The loss of the posterior fixation," says Schultze,[2] "is quite particularly the cause of the backward displacement of the fundus uteri. If the action of the retractores and the elastic elements of the folds of Douglas is wanting after copious evacuation of the rectum, the vaginal portion remains standing forward. The next filling of the bladder presses the corpus uteri backward. Each new filling of the rectum and of the bladder adds its effect to the preceding, and thus after the evacuation of the bladder or rectum once or several times a position of the uterus appears in which the intra-abdominal pressure of the abdominal contents affects the anterior surface of the corpus uteri more decidedly than the posterior. The fundus is forced into the hollow of the sacrum."

A potent factor in the production of a weakened and relaxed condition of the retractores is, according to Schultze, parametritis posterior. Dr. Emmet, as previously mentioned, has called frequent attention to the existence of this form of parametritis, and finds in its effects an explanation of many bladder symptoms. This parametritis, as we saw, may occur during the puerperal condition or it may affect the nulliparous woman or the virgin. It is not necessary to stop here to discuss the question whether this form of inflammation is a parametritis or a perimetritis. I, for my part, believe it to be parametritis; but, be this as it may, this much is certain, that as a result of this parametritis—or perimetritis, if you will—in a certain class of cases, after the absorption of the exudation the retractores lose their elasticity and contrac-

[1] *Loc. cit.*, p. 61.

[2] *Loc. cit.*, p. 132.

tility and become atrophic and relaxed; the uterus loses the posterior fixation of its cervix; the vaginal portion drops forward; and the first time the bladder becomes filled and the intra-abdominal pressure is called into action the uterine body is thrown into the hollow of the sacrum. It is only necessary to refer for a moment, in passing, to the effects of a parametritis anterior in producing an anterior fixation and subsequent retroflexion, and to the effects of cicatricial contraction after great loss of substance consequent upon vesico-vaginal fistulæ, in producing a like result. A limited category of anatomical causes, eventuating in the origin of retroflexion with a rigid angle, depends on the differences in the nutrition of the anterior and posterior wall. E. Martin considered that defective retrograde metamorphosis played a conspicuous part in the causation of retroflexion when the placental site was situated on the anterior wall.

No exposition of the etiology of retroversio-flexio can lay any claims to completeness without reference to the influence of the puerperal state in the production of this morbid condition. During the puerperal state two predisposing factors come into play which render it comparatively easy for dislocating forces to unfold their efficacy. All the pelvic organs are in a condition of relaxation, and the uterus is enlarged and swollen; if, therefore, the patient lies persistently on her back, and the bladder is allowed to become distended, and if the rectum, in addition, is allowed to be permanently filled, it must follow as an almost necessary consequence that the fundus uteri is forced backward on the one hand, and the cervix is anteposed on the other; the retractores are hindered in their involution, and retroversio-flexio is the result.

Another and very frequent cause of retroflexion is laceration of the cervix. Dr. Nathan Bozeman of this city has studied the subject of retroversion in relation to lacerations of the cervix in a paper read before the American Gynecological Society in 1878. He remarks that "laceration of the cervix may contribute to the acquired or morbid forces"—dislocating forces I understand him to mean—"but, independent of endometritis and subinvolution, so slight and unimportant an injury can hardly be expected to lead to such serious derangement of the counteracting forces." How irrelevant this conclusion is I shall immediately proceed to show. In the study of the mechanism of posterior displacement from this cause I shall avail myself of the excellent monograph of Küstner previously referred to, as I believe his explanations are correct, and my clinical observations are confirmatory of them in all essential points. With the great frequency of laceration of the cervix as a consequence of childbirth on one or both sides all gynecologists are familiar. If the laceration affects both sides of the cervix, that of one side is generally deeper than that of the other. When the laceration is deep—and it may extend into the parametrium

of the corresponding side—inflammatory processes are set up which soon, however, as a rule, end in cicatricial contraction. The vaginal portion is drawn over to the affected side in consequence of this cicatricial shrinkage. These cicatricial bands or cords, running off laterally from the lacerated cervix, are often met with. What are the consequences, now, of this cicatricial contraction? The two broad ligaments are no more capable of performing their normal functions in a proper manner, the one on account of immoderate traction, the other on account of passive relaxation; the uterus goes over more sluggishly into its normal condition of anteflexion after each evacuation of the bladder and rectum than it would were it not laterally fixed. However, this is not all. From the fact that the uterus is fixed on one side the movements which it makes when the bladder is full do not occur as a movement *in toto* behind (retropositio), but as a movement of the fundus backward, the portio remaining unmoved. This movement, which even in excessive fulness of the bladder would place the uterus with its longitudinal axis scarcely behind the pelvic axis, is exceedingly hazardous, because the portio remains standing relatively forward. A circumstance, however, which especially operates unfavorably against the maintenance of the normal position is the fact that under the conditions just mentioned the rotation takes place, not about an axis which goes transversely through the middle of the cervix, but about an axis which cuts the uterus obliquely, and, in fact, quite unsymmetrically—about an axis which is nearer to the longitudinal than to the transverse axis. In this oblique position the uterus needs but a slight excursion to pass from its normal position into retroversion. A moderate degree of fulness of the bladder, a rather long continuance on the back in the recumbent posture, carry the fundus over to a point from which the intra-abdominal pressure can throw it into retroversio-flexio. This theory, Küstner thinks, finds its confirmation in the circumstance that lateral fixation of the cervix is so frequent, every gynecologist of extensive practice having almost daily opportunity of observing it. Finally, my experience is in exact accordance with that of Küstner when he says that in making an endeavor to replace such a retroflexed uterus by bimanual manipulation, if there is the slightest asymmetry in the position of the portio the uterus is much more easily replaced by making it assume a more or less transverse position, the portio remaining where it is fixed and the fundus on the opposite side, and rotating it about its longitudinal axis. The fact, now, that in restoring such a retroflexed uterus to its normal position the rotation around the longitudinal axis takes place more readily than around the transverse axis speaks in favor of the view that the reverse rotation—that is, that from before backward—occurs more readily too around the longitudinal axis than around the transverse axis. It is

obvious, therefore, that lateral fixations, which compel the uterus to execute its physiological movements or rotations around the longitudinal axis, predispose it in a great degree to retroflexio.

Symptoms.—The symptoms of acute retroversion are rectal tenesmus, symptoms of metritis and peritonitis, and urinary disturbances: the symptoms may further be complicated by the injury which caused the retroversion. The symptoms of chronic retroversio-flexio are so multiform that they embrace the entire gamut of morbid sensations. Besides the symptoms derived from disturbance of the genital functions and those of the neighboring organs, various nervous and hysterical phenomena are called into existence, while remote organs, apparently standing in no sort of connection with the uterus, manifest functional disorder. Hence the most varied alienations of the psychical sphere, the strangest forms of anæsthesia and hyperæsthesia of particular portions of the body, the most persistent forms of neuralgia, and, finally, phenomena of spasm and paresis involving numerous groups of muscles, may be dependent entirely upon retroversio-flexio, and can be partially or completely relieved only by a restoration of the uterus to its normal position. From what has been said it will not excite surprise to affirm that in a certain class of cases the uterus may be retroflexed if it is otherwise normal, and yet manifest no morbid phenomena. Therefore some gynecologists have drawn the illogical conclusion that it is not the change of the position in itself that evokes the morbid train of symptoms, but the inflammatory conditions which complicate it. Leaving out of view the important circumstance that retroversio-flexio is especially liable to inflammatory conditions which frequently extend to the neighboring peritoneum, clinical observation shows conclusively that the abnormal position alone produces symptoms injuriously affecting the health of the patient. Pains in the back, hardly ever missed, are usually referred to the region of the sacrum: these are almost always relieved or moderated by a restoration of the uterus to its normal position. They are intensified by the association of a catarrhal inflammation of the uterus. Often, simply and solely on account of the abnormal position of the uterus, the circulation is unfavorably affected in this organ, and venous stasis is a necessary consequence. This will be manifested by a sensation of fulness and weight in the pelvis, a "bearing-down" feeling as if some foreign body were to be expelled, while the pains in the back are increased. The mucous membrane will naturally participate in the irritation which affects the whole organ, and consequently the symptoms of chronic endometritis catarrhalis will be manifested. In consequence of the blood-stasis and the proliferation of the mucous membrane, menstruation becomes profuse. Exceptionally we may find amenorrhœa as a transient symptom, or menstruation may be scanty. The rule, however, is that menstrua-

tion is more profuse, lasts longer, and recurs at shorter intervals than is normal.

And here we have a striking proof of the proposition affirmed, that it is the abnormal position which is productive of the major part of the morbid phenomena; for if the retroflexed uterus, in which this symptom has continued for years even, is restored to a correct position, the menstruation will assume a normal type. After the retroflexion has existed for many years the menorrhagia may cease and menstruation become scanty, partly in consequence of the general anæmia, partly in consequence of the atrophy of the mucous membrane the result of the chronic endometritis. In another class of cases, notwithstanding the increase of the anæmia, menorrhagia persists and becomes worse by degrees, and the menopause is delayed far beyond its usual time of appearance. I have had repeated opportunity of observing the premature recurrence of menstruation in consequence of retroflexion in women who are nursing. When there are evident signs of chronic catarrh, as is usual, the menstruation will generally be accompanied by more or less dysmenorrhœa. Fritsch observes that in multiparæ the blood escapes so easily from the vessels of the mucosa, and flows out of the wide uterine cavity with such little difficulty, that dysmenorrhœa does not exist. This is not my experience. In nulliparæ the dysmenorrhœa is, to be sure, much more intense than in parous women, but even in the latter it is very usual to observe pains in the lower part of the back, in the hypogastrium, in the inguinal regions, besides uterine colics. With reference to sterility, it may be affirmed that at first retroflexion does not hinder conception in the case of parous women. But, on the other hand, they are very liable to abort, and the results of therapeutical measures show that this result is directly due to the abnormal position, for if the uterus be restored to a proper position, and maintained there, pregnancy will not be interrupted, as I have repeatedly demonstrated clinically. After retroflexion has existed a long time, however, such women become sterile on account of the general anæmia, the uterine catarrh, or the oöphoritis or perimetritis which very likely complicates it. In the case of nulliparæ sterility is a very frequent accompaniment of retroflexion, as we are more apt to find here complicating perimetritis or its remains.

Painful defecation is a frequent symptom of retroflexion. The relaxed *retractores*, although the body of the uterus lies between them, offer no obstacle to the passage of the fecal matter, but the retroflexed uterus is so liable to hyperæmia, increase of volume, and peritoneal irritation from causes not usually provocative of these conditions that it need cause no surprise that the evacuation of the loaded rectum is often followed by tenesmus or other disagreeable sensations in the pelvis. Constipation is often met with in retroflexions: this is not due,

as might at first thought be supposed, to the encroachment on the rectum by the uterus; it is rather due to the sluggishness of the intestinal canal from paresis of the muscular tissue; and this overloading of the intestines with fecal matter doubtless contributes to increase the annoyances of which the patient complains by the injury inflicted upon the fundus by its passage through the rectum.

Urinary disturbances are not so frequently complained of as in anteflexion, but frequent micturition sometimes forms a most disagreeable symptom. Retention of the urine is only observed when the uterus has attained the volume belonging to it in the fourth month of pregnancy. In consequence of their dislocation backward the ovaries are the cause of manifold painful sensations in retroflexions. They are congested, and often exquisitely sensitive on pressure. They are often found in Douglas' pouch or in close proximity, so that in each evacuation of the rectum they are exposed to injury. Schultze expresses the opinion that the existence of retroflexio is favorable to the origin of ovarian tumors. Hildebrandt[1] communicates a number of cases in which, in consequence of flexion of the ureters, there was an obstruction to the passage of the urinary secretion. This is a rare phenomenon. Nephritis in women suffering with retroflexion is a more frequent occurrence. Not infrequently we meet with phenomena of paresis, usually involving groups of muscles of the lower extremities, but sometimes extending to muscles elsewhere situated. The explanation is different according to the case. Sometimes this affection is due to direct pressure of the enlarged uterus on the motory nerves of the inferior extremity; at other times it may be traced to inflammatory processes in the pelvic connective tissue; and, again, we must assume that it is a reflex phenomenon. In one case to which Hildebrandt refers, and which he treated in association with Leyden, it was the opinion of the latter that the painful paresis of the left leg was caused by neuritis: in this opinion Hildebrandt coincided. Such a neuritis of local origin, according to Leyden, may lead to myelitis. At times we are able to demonstrate that the disturbances of innervation are due to pressure of the retroflexed uterus by the rapid disappearance of the symptoms on rectifying the position of this organ. Many and varied forms of other neuroses are produced by retroflexion, and can only be successfully treated by having regard to their cause. Schroeder[2] describes a case of chorea which was temporarily relieved by the temporary removal of the flexion, and entirely disappeared after the permanent restoration of the retroflexed uterus to its normal position. Chrobak[3] publishes a case of a severe form of neuroses affecting respiration which was at once arrested by the reposition of the uterus.

[1] "Ueber Retroflex. des Uterus." *Samml. kl. Vorträge*, No. 5, p. 33.

[2] *Berlin. klin. Wochenschrift*, 187, No. 1.

[3] *Wiener med. Presse*, 1869, No. 2.

Not long since a patient came under my care who had facial neuralgia, gastric disturbances, and depreciation of the nutrition of the body generally, her whole appearance being that of a woman in declining health. As I could find no explanation for these symptoms from the condition of the other organs, I instituted an examination of the pelvis, and found a retroflexed uterus, though there had been no symptoms whatever referable to the pelvis. Proper orthopædic treatment was followed by the most gratifying results, the patient being restored to excellent health in a comparatively short time. In the psychical sphere, leaving out of view the long train of hysterical manifestations, two deficiencies are especially dwelt on by the patient in the narration of her "Iliad of woes:" first, failure of the memory, and, secondly, incapacity for prolonged mental effort.

Diagnosis.—*Retroversion* can be diagnosed, as a rule, by examination *per vaginam* through the peculiar direction of the vaginal portion, which lies forward in the pelvis, and through the demonstration of the backward position of the supravaginal portion of the cervix and body; and this the relaxed condition of the fornix permits without difficulty ordinarily. By bimanual palpation we notice the absence of the fundus in front, only vaginal and abdominal walls intervening between the two hands.

Retroflexion may be generally recognized without difficulty. On examination *per vaginam* the portio will be found low down in the pelvis, often close to the vulva or approximated to the symphysis, while in the posterior fornix and continuous with the cervix, but separated from it by a groove of greater or less depth, will be found the body, whose form is characteristic. The connection of the body with the cervix, and its flexion on it, can usually be perceived with almost absolute certainty. From the rectum the body can be still more plainly recognized. Errors from this examination are by no means excluded, however, for tumors behind the uterus can very closely simulate the uterine body; as, for example, myomata attached to the posterior wall, exudates in Douglas' pouch, and the enlarged ovary or small ovarian tumor, all of which may be attached to the cervix. When there is any doubt, bimanual palpation must be called into requisition. The hand manipulating through the abdominal walls perceives that the cervix is not directly continued into the body; in order to that the whole organ must be anteposed: on the contrary, it feels the place where the flexion exists, and farther behind it finds the surface of the flexed body, which was previously anterior, and by the co-operation of the hand exploring the vagina it establishes the fact that the tumor which is between the opposite fingers is nothing else than the uterine body. In this way the form, size, mobility, and sensitiveness of the organ can be fully appreciated. In regard to adhe-

sions impairing mobility or preventing it, we shall postpone discussion until we come to speak of treatment. The rectal examination is especially valuable when the abdominal walls are rigid, as by drawing the uterus down with a tenaculum or volsella the fundus can be readily reached *per rectum*.

With reference to the differential diagnosis between retroflexion and tumors lying behind the uterus, it is only necessary to call attention to the fact that bimanual palpation will always show us the existence of the body in front of the tumor, and the exact relation of the fundus to the tumor can often be ascertained by drawing down the uterus with the volsella. The use of the sound to confirm the diagnosis or to make a differential diagnosis is rarely necessary.

TREATMENT.—*Retroversio-flexio* is always pathological. The indications in the way of treatment are—*first*, to adopt such prophylactic measures as will prevent the occurrence of retro-deviations, if this be possible; *secondly*, to restore the organ already displaced to its normal position; and, *thirdly*, when thus replaced to maintain it *in situ*. *Prophylaxis* is usually left out of the question by systematic writers, a notable exception, however, being Winckel; but I am convinced that much may be here accomplished. As said before, my clinical experience fully demonstrates the fact that backward displacements, especially retroflexions, are quite common in young girls and unmarried women. Hence it is the important duty devolving upon the family physician to watch the first appearance of menstruation; and this he can now-a-days often do, as careful mothers frequently consult him on this subject. All anomalies of menstruation should be appropriately treated. During the first days all mental and corporeal exertion should be strictly interdicted, and especially should young girls be prohibited from dancing or playing upon the piano during menstruation. The proper evacuation of rectum and bladder, it need scarcely be said, is a matter of pre-eminent importance.

As so many of the cases of this anomaly date their origin from the puerperal period, either after abortions or after labor at term, *prophylaxis* is especially here in place. We must therefore be careful to see to it that the bladder is emptied at proper times, and not allowed to become distended, that the rectum is not overloaded, and that the patient be cautioned against lying too long on her back. As the *retractores* partake of the subinvolution of the uterus, whenever we find any evidences of the existence of this condition in the latter we may safely assume that the former are involved, and must adapt our measures accordingly; hence ergot will be frequently indicated to bring about involution in the whole. When symptoms of already existing retroversio-flexio are present, the sooner the displaced organ is restored to its normal position the better the prospect of a speedy and permanent cure.

It is not to be denied that at times we meet cases of retroversio-flexio in which there are neither subjective annoyances nor anatomical changes united with the anomalous position which can be objectively demonstrated; the organism seems to have gradually accommodated itself to the abnormal condition of things. This is not so infrequently found in women who have passed the menopause. Here it might be proper to abandon any attempt at rectification of the flexion. The first question which ordinarily confronts us and demands solution is this: Can the uterus be replaced, or is it fixed in its abnormal position by perimetric adhesions? The decision of this question is not so easy: the enlarged uterus may be caught between the folds of Douglas as it lies in its abnormal position, and in consequence of the incarceration there may be an augmentation of the congestion, so that every attempt at reposition evokes such severe pain that we must desist from the effort. But even when not caught between these folds the enlarged and inflamed uterus may still be so sensitive when lifted from its anomalous situation as to contraindicate attempts at orthopædic treatment. Under these circumstances a judicious preliminary treatment is indicated. Rest in bed, the copious use of vaginal douches of hot water, the wet pack at night to the lower part of the abdomen, sitz-baths made stimulating by sea-salt, scarification of the vaginal portion, or the vaginal pack as recommended by Engelmann[1] and Emmet,[2] will be followed by such an improvement in the inflammatory symptoms that the repeated attempt at reposition will either be crowned with success or we will be convinced of the existence of perimetric adhesions. In some rare cases it will be necessary to resort to the use of chloroform, even when there are no adhesions, especially when we have to deal with a highly neurotic patient.

We may enumerate three methods of replacing the retroflexed or retroverted uterus: 1. Bimanual vagino-abdominal and recto-abdominal manipulation. 2. With sound or with Sims' or Emmet's repositor. 3. By genu-pectoral posture, combined with traction on the uterus by tenaculum or volsella, and pressure on the fundus from the rectum.

(1) When it is decided to replace the uterus by the bimanual method, we direct the patient to lie on her back: the fore and middle fingers, usually of the left hand, are introduced into the vagina. It may possibly be now ascertained that the fingers do not reach high enough: it will be necessary then to manipulate from the rectum. Chloroform will here, probably, be required, and at the same time the patient must be placed in the lithotomy position and brought down to the edge of the table or bed on which she is lying, in order that the hand may have free play. Hart and Barbour recommend that the replacement be made with the

[1] *New York Obst. Journal.*

[2] Paper read before Woman's Hospital Alumni Association.

index finger in the vagina and the middle finger in the rectum. The method recommended by Schultze is much the more effective, and is the one I adopt in practice, and shall here describe. Supposing that we make the attempt to lift the uterus up from the vagina, it will be necessary to place the two fingers lying in the vagina on the body as near to the fundus as we can possibly reach by depressing the perineum. With slow and steady pressure, gradually increasing in power, the body is pushed up along the sacrum past the promontory to the superior strait. The uterus may possibly not lie in the median plane, but deviate to one side or the other: this will very probably be the case if the retroversio-flexio is complicated by laceration of the cervix. In that case we may find, as indicated before, that elevation will be effected more easily by rotating the organ around its longitudinal axis. If it lies more or less in the median plane, it will be judicious to try its lateral mobility with one finger on one side and the other finger on the opposite, and then to push it up from the side which offers the least resistance. As a rule, the efforts at reposition are attended with a good deal of pain. If the diagnosis is certain, we should not desist from these efforts unless the resistance opposing them is so great as to prove the existence of adhesions, or, at any rate, to make their existence very probable, or, on the other hand, the pain we inflict is obviously too great for the patient's welfare. Under these circumstances further attempts must be postponed until the nature of the obstacles can be ascertained when the patient is under an anæsthetic.

Assuming that we have been able to elevate the fundus to the plane of the superior strait, it devolves on the hand manipulating through the abdominal walls to seize the mounting-up organ and bring it forward. In order to do this the hand operating through the abdominal coverings must get behind the fundus, so as to act on its posterior face. This is sometimes a very difficult manœuvre: the vagina may not be long enough to enable us to lift the fundus to the requisite height, or if we operate from the rectum the finger may not be sufficiently long, or the subcutaneous fat in the abdominal walls may be too thick, or the walls may be too rigid, to enable us to accomplish it. In these circumstances we will be much assisted if we press on the anterior aspect of the vaginal portion, or, if possible, on the supravaginal part of the cervix, the pressure being directed toward the hollow of the sacrum. I have found it exceedingly advantageous to exert pressure on the vaginal portion with the fore finger while the middle finger continues simultaneously to urge the fundus upward. If these two fingers, however, have to be introduced into the rectum to elevate the fundus, the thumb can be inserted into the vagina and pressure exerted by it on the vaginal portion. As soon as the fingers of the hand, manipulating from the outside, have succeeded in getting behind the fundus, the

middle or fore finger of the other hand, in the vagina, pushes the vaginal portion backward, so that the uterus now occupies the normal position.

Another manœuvre can be practised with success at times, and should be kept in mind. It is thus described by Emmet:[1] "For employing this method the patient is placed on her back, with the knees flexed and the hips drawn down to the edge of the operating-table or chair. Introduce then the index finger into the vagina, and direct the point of the tenaculum so that it may be hooked into the posterior lip just within the os. The instrument is to be used for the purpose of gently drawing forward the organ sufficiently toward the vaginal outlet, until we are satisfied that the fundus is distant enough from the hollow of the sacrum to pass the promontory when elevated. At the first attempt this manipulation must be done with care, and if a point is reached at which great pain is produced we must desist. By this manœuvre the uterus of course becomes more retroverted than before. To correct this the perineum should be pressed firmly back, that the finger in the vagina may be passed up as far behind the uterus as possible, and made at the same time to lift the organ. When the fundus of the uterus has been thus elevated, and while it is being held up by the finger, the cervix is to be suddenly carried in the arc of a circle downward and backward by means of the tenaculum, which has been hooked in the anterior lip and is held in the other hand. . . . . The finger must be quickly passed from the posterior cul-de-sac against the anterior lip, the tenaculum withdrawn, and the organ thrown forward by passing the finger repeatedly down the anterior face of the uterus, so as to press the cervix downward and backward into the hollow of the sacrum." Instead of the tenaculum, I prefer to use the volsella, as recommended by Hart and Barbour, Schroeder, Küstner, and others, for the reason that the tenaculum is apt to pull out, and at the same time wound the tissue. The guiding finger, too, of the gynecologist may be caught by the point of the tenaculum under the conditions just mentioned.

(2) Replacement by the sound can be very advantageously employed as a substitute for bimanual manipulation, under certain circumstances; as, for example, when the latter procedure causes a great deal of pain, when the abdominal walls are thick and unyielding, and the use of an anæsthetic is contraindicated or inconvenient. If the use of the sound is guided by antiseptic principles, and if due care and dexterity are brought into requisition, neither pain nor danger is to be anticipated. Dr. Sims invented a very ingenious instrument for replacing the uterus, to which he gave the name "elevator." As he himself remarks, it is nothing but Simpson's sound with a joint two inches from the end.

[1] *Loc. cit.*, p. 299.

Emmet modified this instrument by dividing the uterine portion into segments movable from the straight position only in one direction. These instruments are both useful, and Emmet's especially has proved valuable in my hands in many cases. Inasmuch, however, as retroversio-flexio is a very common affection, and consequently must come under the care chiefly of the general practitioner, it is a matter of exceedingly great importance to simplify our methods of reposition, and dispense, as far as possible, with instruments which only a specialist will be likely to have in his armamentarium; and hence the sound must generally be employed. We must be very careful not to employ too much force, and, as the sound gives us great leverage, this blunder may be easily committed. The curve of the sound must be made to conform to the degree of retroflexion, and must be introduced with the concavity directed backward instead of forward. The sound is now so rotated that the intra-uterine portion retains an unaltered position, except a rotation on its longitudinal axis, while the handle moves laterally in a wide sweep, describing the arc of a circle in a direction from behind forward. The handle of the sound is hereupon slowly and gently depressed toward the perineum, and thus, as its concavity is now directed forward, it gradually replaces the uterus. In practising this manœuvre we can feel whether the uterus is free, or if it lies incarcerated in Douglas' pouch, or if it is fixed by perimetric adhesions. Before withdrawing the sound it will be well to ascertain by external palpation if the uterus is lying in its normal position of anteflexion.

(3) The genu-pectoral method of replacing the retroflexed uterus, though known before, was first systematized as a method by Dr. H. F. Campbell. As Thomas[1] remarks: "Campbell's method never does harm, generally effects great good as an adjuvant to other treatment, and in rare cases proves in itself sufficient for complete relief." When the patient is made to assume this posture the abdominal contents gravitate downward and forward; unless the abdominal walls are unusually rigid or there is an unusual fulness of the abdominal cavity, there is a decided lowering of the intra-abdominal pressure, so that it sinks below the atmospheric. If the vaginal introitus is not very narrow or is artificially opened, the vagina becomes distended with air. Campbell devised a glass tube, open at both ends, slightly bent, which the patient inserts herself on assuming the genu-pectoral posture, in order to admit air into the vagina. I agree entirely with Hart and Barbour in their statement that the retroflexed uterus does not become replaced, as Campbell supposed. "It moves as a whole," they remark, "near the sacrum, and if already retroverted it becomes still more so. To effect replacement we must either push the fundus forward or draw the cer-

[1] *Loc. cit.*, p. 440.

vix backward. It is best to combine these actions: having laid hold of the cervix with the volsella *per vaginam*, we draw it downward, while with the index finger of the right hand, *per rectum*, we press the fundus toward the bladder. This method will scarcely be required except to replace the retroflexed gravid uterus."

Before proceeding to discuss the methods of retaining the uterus after its replacement, it will be proper to dwell at some length here on the means at our command for separating the adhesions that fix the uterus. And, in the first place, I shall describe the method of forcible reposition advocated by Schultze. It is important that the stomach, intestines, and bladder are, as far as practicable, in an empty state before the patient is brought under the influence of a narcotic. She is then placed in the lithotomy position and brought down to the edge of the operating-table. An assistant on either side fixes the corresponding thigh in moderate flexion and abduction, while a third gives his undivided attention to the administration of the anæsthetic. The operator, standing before the patient, introduces the index and middle fingers of the left hand high up in the rectum. If there are any fecal masses in the rectum, they are washed out by a stream of hot water, while the fingers in the rectum keep it open. Even if no contents are found in the rectum, this irrigation is advantageous, because the fingers can ascend higher in the dilated rectum. Without this irrigation it is often difficult for the fingers to find their way from the ampulla recti into the narrower part situated above the folds of Douglas, and yet it is very important that the fingers reach beyond this isthmus. If the fingers have passed the narrower portion—or, when very narrow, when one has passed—the operator supports the left elbow on the left knee, for which purpose he places his left foot on a chair standing beside him. The assistance he obtains in this way is very great: there is, further, no expenditure of force on the part of the arm necessary to push up the uterus: the entire attention is concentrated on, and the entire force to be applied is limited to, the dextrous movement of the fingers lying high up in the rectum. After accurate examination of the body of the uterus and the ovaries by palpation—and here the thumb can effectively co-operate from the vagina—the fundus is gradually elevated. Simultaneously the right hand, manipulating through the abdominal coverings, embraces the fundus and endeavors to bring it forward. In this passive movement of the uterus the adhesions are made tense according to their extensibility or length. The extent, origin, and course of the adhesions are accurately ascertained by this examination. Membraniform adhesions are separated by the points of the fingers, as the adherent placenta is detached from the wall of the uterus; isolated cords are caught by the finger in the rectum and slowly broken with a firm hand while the fundus is fixed. Mem-

braniform adhesions of the uterus to the rectal wall offer no serious obstacles to momentary replacement, because the rectal wall follows the uterus; but when the rectum contracts the uterus is drawn back to its old position. A similar state of things exists in the case of cicatricial shrinkings of the peritoneum, because they are displaceable upon the subjacent tissue even when not extensible. Adhesions of tube or ovary to the posterior pelvic wall demand quite special caution. In these circumstances only a slowly-increased pressure should be applied, and if it does not succeed in releasing the uterus in the first sitting, the attempt must be renewed in eight or ten days, provided no reaction followed the first trial. Schultze has suggested another procedure, which he terms "intra-uterine reposition," for especially difficult cases. It consists in this, that the palpating finger, instead of operating from the fornix vaginæ or rectum, acts from the fundus within the uterus, which has previously been dilated with that view. Two fingers are introduced into the vagina, one of them into the retroflexed uterus up to the fundus. The finger straightens the uterus, then is rotated with the palmar surface toward the anterior uterine wall, and now bent toward the abdominal wall. The firmness and direction of the fixation are in this way ascertained, and the force requisite for overcoming it can be judged with some certainty. When the abdominal coverings contain an inordinate quantity of fat, or when the uterus is very firmly fixed, it will be advisable to palpate from the rectum and inner surface of the uterus simultaneously. If the vaginal portion is fixed by a volsella and given to an assistant to hold, very accurate bimanual palpation may be made by two fingers of one hand in the rectum and one finger of the other hand in the uterine cavity. If peritoneal adhesions have been separated in replacing the uterus, several days' rest in bed is imperatively demanded, and Schultze, as an additional measure of precaution, recommends that an ice-bag be laid upon the abdomen for the first twenty-four hours. Obstacles to replacement which are not on the peritoneal surface, but have their seat in the subjacent tissue, peritoneal contractures and indurations, parametric cicatrices, contraindicate forced orthopædic measures. For my own part, while willing to admit that the procedure advocated by Schultze will be attended by no disastrous consequences in the preponderating majority of cases if proper care be used, I have never felt called upon to put it in practice, for the reason that slower methods have led to the same result with fewer attendant dangers.

Before proceeding to describe the means at our command for producing absorption of the adhesions, it may be said in general terms that the prospect is better when the sensitiveness of the uterus is slight, and that even quite extensive exudations can be absorbed in time and the uterus become movable. My experience has proved con-

clusively that the opinion expressed by Schroeder is entirely correct, that the most effective of all means to free the uterus from its adhesions is *gravidity*. The fear has been expressed that when conception has taken place an abortion will be the consequence; which, though occasionally happening, is by no means the rule. In order to bring about an attenuation, and finally a detachment, of the adhesions, it is first of all important to facilitate the relative movements of the organs situated in the pelvis. The peristaltic movements of the intestine are therefore stimulated by copious enemata of warm water thrown into the rectum; these are continued for a considerable length of time. The circulation in the pelvis is favorably affected and absorption promoted by sitz-baths, made more stimulating by sea-salt: the water should be warm. Hot-water vaginal douches, it need scarcely be said, are of incalculable benefit. The wet pack to the hypogastrium, kept on all night, has in my hands been attended by such gratifying results in relieving pain and stimulating absorption that I am astonished that it is employed so infrequently by gynecologists. The methods of Engelmann of St. Louis and Emmet, to which reference has already been made, deserve trial to bring about absorption of remains of perimetric and parametric inflammatory exudations by the use of the vaginal tamponade. Engelmann makes his tampons of antiseptic sheep's wool and soaks them in astringent solutions.

In *massage* according to Brandt's method we have a means, when applied to the pelvic contents, of such potency as to leave little to be desired. By cautious manipulations and gradually-increasing application of force we attempt to dislocate the uterus and bring it forward; and we can often, in a comparatively short time, loosen and detach even quite firm adhesions. It requires a good deal of practice, it may be said, to determine the amount of effort we must put forth in these attempts; it is better, in the beginning, to err always on the side of safety and do too little rather than too much. The manipulations of the operator should never be so powerful as to elicit from the patient a cry of pain. It must be borne in mind that we may confidently expect advantage, and never harm, from the employment of massage if all inflammatory phenomena have disappeared. A preparatory treatment of irrigation of the vagina with hot water will have the tendency to make the adhesions softer and more yielding. If the slightest reaction follows this treatment it must be interrupted for a short time. In employing massage the active intervention of both hands in co-operation is demanded. The hand on the outside partly controls and partly aids the fingers in the vagina. As a rule, we should not have recourse to a pessary until the fundus is well brought forward, but occasionally, when the uterus is elevated to about the promontory, the pessary may be applied.

The question now confronts us as to what is the best means at our disposal *to retain the replaced uterus in its normal position*. In the very great majority of cases this may be accomplished with absolute certainty by vaginal pessaries. The best forms are the Hodge pessary and its modifications by Emmet and Thomas. The Albert Smith pessary is also very useful, but as usually sold in the shops the posterior bar is curved so sharply as to press on the posterior face of the vaginal portion, and hence is liable to cut in or produce an erosion. I have generally been compelled to remodel it. The name given by Hodge to his pessary, the "lever pessary," was founded on a misapprehension of the mechanism of its action. He remarks in his book on the *Diseases peculiar to Women*, "It operates as a lever in elevating the fundus from its malposition against the sacrum to its normal position behind the bladder; that portion of the pessary which is posterior to the neck of the organ being the 'short arm,' while all anterior to the neck is the 'long arm,' and the 'fulcrum' or support is the posterior surface of the vagina. As the long arm or horn is depressed by the finger of the practitioner, the short arm rises and carries with it the body and fundus of the uterus." He is speaking here of his horse-shoe or open-lever pessary, but, as he observes, the closed lever acts on the same principle. The object sought to be attained by the pessary, however, is to compel the vaginal portion to remain permanently in a position near the posterior pelvic wall, or, in other words, to fix it behind; and this is accomplished by the action of the posterior bar, which pushes the posterior fornix vaginæ upward and backward, and thus by its traction tends to keep the cervix behind. As the cervix cannot deviate forward, the uterus must be maintained in a permanent position of anteflexion, the intra-abdominal pressure acting on the posterior surface of the uterus under these conditions. In the proper adjustment of a pessary, in the selection of one of suitable size and shape, lie a problem not easy to solve. Sims[1] asserts "that each individual case must be especially studied, and that its complications and peculiarities must be investigated, understood, and regarded, if we will cherish the hope to be able to treat them certainly and successfully." Says Emmet:[2] "This subject is one of the most important and least understood. . . . . The practitioner, to become an expert in fitting a pessary that it may do no harm, must have a decided mechanical talent, and that the full benefit may be derived from the use of the instrument he must be able to appreciate slight shades of difference which would be entirely overlooked by others." At the last meeting of the German Gynecological Society, held in Halle in May last, Fritsch declared that he considered it easier to perform a laparotomy than to apply a well-fitting pessary, and zealously advocated the treatment by pessaries. He

[1] *Clinical Notes on Uterine Surgery.* [2] *Loc. cit.*, p. 302.

had spent ten years in learning the treatment by pessaries, and considered it the most difficult subject in the whole of gynecology. In regard to the *material* of which they should be made, my preference has always been for vulcanite. Schultze has lately recommended celluloid in enthusiastic terms. Rings made of this material can be made soft in boiling water, and then moulded to any shape. The aluminium is objectionable, according to Schroeder, because it becomes corroded by the action of the vaginal secretions. The hard-rubber or vulcanite pessaries can be bent to any shape desired by first smearing them with vaseline and then heating in the flame of a spirit-lamp. Pessaries made of copper wire and coated with gutta-percha are objectionable, as the gutta-percha is absorbent and retains the secretions, and these, undergoing decomposition, injuriously affect the vaginal mucous membrane. In choosing a pessary it must not be too small, on the one hand, as it will then fail of its purpose, or too large, on the other, for then it will irritate the vagina or cause inflammation. The modification of the Hodge pessary by Emmet will be found in the shops of all the surgical-instrument makers of this city; they are of six different sizes, and I can, from extensive experience, confirm the statement of Dr. Emmet, "that they seldom require to be altered, except as to the width at some point, the curve for the posterior cul-de-sac, or the arc for the neck of the bladder." Viewed from the side, each branch shows a gentle sigmoid curve. In some cases it will be found that this form does not fulfil its purpose: the anterior arc may present in the vulva and have a tendency to slip out, especially when the vagina is short, or there may be prolapse of the anterior vaginal wall which is not corrected by the pessary. Here it will be better to bend the anterior arc upward, so that the pessary has a single curve, and the anterior bar will then lie behind the symphysis. If it presses against the urethra, a slight indentation of the anterior bar will probably remedy the evil. If ulceration is caused in the posterior fornix close behind the vaginal portion, the posterior bar may be bent backward so as to make it less curved, and hence made to press on another point.

The great difficulty in the use of pessaries consists in giving to the pessary such a shape as will meet the requirements of the individual case. The criterion by which we can judge whether the pessary is accomplishing its purpose is, first, that it should maintain the uterus in its normal place, and, secondly, that it should occasion the patient no annoyance or discomfort. In order to this we must keep the patient under observation for some weeks, for it often happens that after replacing the uterus and adjusting an apparently perfectly suitable pessary, when the patient returns the uterus is in an abnormal position. It is found, now and then, that the parts behind the uterus are tender, and so sensitive as to make it impossible to use the form of pes-

sary heretofore described: it will then be useful to employ a pessary modelled like the Schultze sleigh or Courty pessary, which acts on the anterior face of the vaginal portion. Byford's is very similar: "By turning the posterior end of an Albert Smith in front of the cervix I devised an instrument which, although I did not know of Courty's pessary, was practically a modification of it." The same idea was suggested doubtless to others. Years ago I saw Dr. Emmet shape a pessary in the same way over and over again. Schultze devised his sleigh pessary, it should be remarked, especially for those cases in which the pelvic floor was very much relaxed. When the vagina is long and wide and shows a general relaxation, the ordinary modifications of the Hodge will not maintain the uterus in its correct place, nor will the figure-of-eight pessary devised by Schultze accomplish the desired result. In these circumstances the pessary which we owe to the ingenuity of Thomas answers an admirable purpose. I can heartily subscribe to the opinion expressed by Fritsch of its excellence when he says: "Of all instruments, it is, in this regard, the most certain, that, once correctly lying, it never permits the uterus to assume the faulty position again." I am not prepared, however, to admit the justice of Fritsch's criticism, that the "pessary heals palliatively, but injures definitely. For it distends the posterior fornix vaginæ so enormously that even after it is worn for years a cure is not to be hoped for. On the contrary, the retroflexio returns immediately after the removal of the pessary." This pessary bears a general resemblance to the Hodge instrument, only the curves are more decided and the lower extremity is elongated and narrowed to a point, while the posterior part is considerably elongated and thickened to a bulb. The action of the instrument depends on the fact that the length and thickness of the posterior extremity maintain the posterior fornix vaginæ above and behind, and thus fix the portio vaginalis. On what, it may be asked, does its retention depend? And why is it not expelled in any augmentation of the intra-abdominal pressure? Its retention depends on the double curve: when the posterior bulbous portion and adjacent curved part are urged downward and forward, the second curve, which lies close behind the pubic arch, is pressed against the latter, and thus an obstacle is interposed to prevent further movement downward and forward. It is therefore necessary, as a rule, that these curves be well marked.

It is not so easy to introduce this pessary, and especially in virgins the introduction is attended with considerable pain. The mode of introduction of a pessary in general is not a matter of indifference: it should always be managed so as to cause the patient as little pain as possible. This manœuvre may be effected with the patient on the back or on her side. Some writers advocate exclusively one or the

other method. I adopt them both, and choose for the particular case that which offers the best facility for introduction. In multiparous women the position on the back may be selected as a rule. In nulliparæ the position on the side will usually be preferable. If the patient is on her back the index finger of the left hand is introduced into the vagina, and by its means the pelvic floor is pressed downward and backward so that the vulva gapes as much as possible. The pessary, supposing it to be one of the modifications of the Hodge, is held by the other hand, having been previously lubricated with an antiseptic unguent, so that the diameter which is to be the transverse when the instrument is properly adjusted is now sagittal, and is then carried through the vulvar orifice and along the guiding finger beneath the vaginal portion until the posterior bar attains to the posterior fornix. When the pessary is to be introduced with the patient on the side, it is necessary to make her assume the Sims semi-prone posture, and the vagina is to be opened by the Sims speculum, or, in the absence of a speculum, we can make the finger of one hand subserve that purpose. The pessary is then inserted in a similar way as just described. When we have convinced ourselves by observation that the instrument does not cause the patient any discomfort, and that the uterus is maintained in its proper place, it will be advisable to see the patient every month or two in order to remove the pessary and thoroughly disinfect it. She should be instructed to use hot-water vaginal injections at least once daily, otherwise the vaginal secretions clinging to the pessary may undergo decomposition, and, becoming encrusted on the instrument, may irritate the vagina. How long a woman must wear a pessary cannot be affirmed beforehand. The longer the uterus has been displaced, the longer the time necessary to enable the relaxed ligaments to return to a normal condition, as a rule, and the longer must the artificial support be employed. It may require months, or even years, before the uterus will stay in place without artificial aid. Even after the lapse of four or five years the uterus may fall into a retroflexed position in a few days after the removal of the pessary. The prognosis which Mundé[1] and Lochlein[2] give is, according to my experience, far too unfavorable. The success recorded by the late Dr. F. B. Watkins in a paper which appeared in the *Virginia Medical Monthly* for November, 1875, is far nearer the mark. In 139 retroversions (under which term were doubtless included many retroflexions) he asserts that complete recovery took place in 114. I agree with Mundé in the opinion he expresses that nothing is more uncertain and unsatisfactory than the treatment of patients who ordinarily attend the outdoor clinic of a hospital, the great difficulty being to keep them under observation for a sufficient length of time. Deriving my opinion from

[1] *Loc. cit.*, p. 396.

[2] *Zeitschrift f. Geb. u. Gyn.*, Bd. viii. p. 102.

the careful study of cases occurring in my private practice, I can confidently assert that if the uterus is replaced and kept in its normal position for a sufficient length of time, success will be the rule and failure the exception. Within the past three months I have removed a pessary from three women respectively, each of whom is permanently cured of her retroflexion. Two of these women have worn a pessary for four or five years, one of them a little more than two years. It is idle, however, to expect favorable results unless the patient is kept under continuous observation, so that the correct position may be maintained and any abnormal backward displacement rectified at once. I shall only allude, in passing, to the treatment by intra-uterine stem-pessaries. It is doubtless an effective method, but the dangers attending it are too great, and the purpose it aims to accomplish can be fully accomplished without risk by vaginal pessaries. All the varied forms of mechanical contrivances which find their point of support on the outside of the body are objectionable, and are fast passing into oblivion. In the language of Emmet, "If there were no other objection to every outside appliance, the fact that the patient has to be manipulating it constantly would be sufficient to condemn it; and there can be no better plan devised for rendering a woman a confirmed invalid."

A most ingenious operation for shortening the sacro-uterine ligament has been suggested by Byford,[1] and twice employed, once with success. It is as yet premature to express an opinion upon its value. Another procedure has been proposed to bring about adhesion between the vaginal portion and the posterior vaginal wall, either by cauterization[2] or by freshening[3] the surfaces and uniting by suture. I have had an opportunity of observing the effects of this method, which was employed undesignedly. A patient under my care had worn a pessary for six months or more continuously, and in consequence of this an ulceration was produced in the fornix vaginæ: after removal of the pessary, and especially after the raw surfaces had healed, the uterus was found in a normal position, which was largely due to the cicatrization following the healing process. "As a matter of course," observes Winckel,[4] "the panacea of modern gynecology has been recommended in order to attach the uterus to the anterior abdominal wall." This operation was first performed by Koeberlé in 1869, and was described by Scheteling.[5] In 1875, Sims performed a similar operation with success. On account of its historical interest Koeberlé's operation will be described, for an account of which I am indebted to Hueter's work:[6] Procedure as in ovariotomy; incision of 12 cm. in

[1] *Diseases of Women, Med. and Surg.*, 4th ed., p. 525.
[2] Courty: *Maladies de l'Utérus.*
[3] Richolot: *L'Union médicale.*
[4] *Lehrbuch der Frauenkrankheiten*, p. 362.
[5] *Med. Centralbl.*, 1869, p. 27.
[6] *Die Flexionen des Uterus*, von V. Hueter, 1870, p. 209.

length in the median line from the umbilicus to the pubes; slow exposure of the peritoneum; its opening to the extent of about 4.5 cm. The uterus was now elevated by the fingers; the left enlarged ovary with its broad ligament brought into the lower part of the abdominal wound; the position of the uterus controlled, the portion of the broad ligament left in the abdominal cavity being 4 cm. in length; finally, a serre-nœud was applied beneath the ovary. In this way the remnant of the ovary, diminished by the scissors, with the end of the tube was fixed in the abdominal wound, where it was kept in its position to the abdominal coverings by a transverse pin. Two deep sutures and eight superficial united the wound. The suppuration of the pedicle was limited to the lower angle of the wound, and was extra-peritoneal. The case progressed to a favorable termination.

The performance of laparotomy for the purpose of curing retroflexio by ventro-fixation is doubtless justified in those exceedingly rare cases in which all other methods have been exhausted, but only under these conditions. We have no right to jeopardize the life of the patient until other and less dangerous methods have been faithfully and intelligently tried. Of course, in those cases in which laparotomy is indicated for other reasons, and in which retroflexio exists, ventrofixation can be employed, as practised by Schroeder and others. Polk[1] has recommended and performed laparotomy with the design of breaking up adhesions in old intractable cases attended by great pain, and has been successful in relieving the symptoms. This practice will hardly find many imitators, nor is it necessary if the methods previously mentioned are adopted. When the uterus requires support, he follows the laparotomy by the operation for shortening the round ligaments. This operation of shortening the round ligaments was proposed by Alquié to cure prolapsus, and Aran considered the operation as applicable to the cure of retroflexio, according to Tillaux. The same thought occurred to Freund, who performed the operation on the cadaver. It was first performed on the living subject by Alexander of Liverpool in 1881. Adams of Glasgow performed it in 1882 without a knowledge of Alexander's operation. In performing this operation the mons Veneris is shaved and the external abdominal ring sought for. An incision is then made parallel to Poupart's ligament 5 to 10 cm. in length in an outward direction from the pubic spine. The incision is made through the skin and subcutaneous fat down to the intercolumnar fascia covering the ring. The external abdominal ring is recognized by oblique fibres crossing it and protrusion of fat at its lower end, and by its depressibility on pressure. "The tissue now bulging out," observe Hart and Barbour,[2] "from the ring the end of the ligament, before entering the mons Veneris, is

[1] *American Journal of Obstetrics*, June, 1887.

[2] *Loc. cit.*, p. 545.

lifted by an aneurism-needle, grasped by the finger, and pulled out gently, any bands preventing this being cut with the knife. The other side is treated in the same way, both ligaments being therefore pulled out as far as possible. The wound is then stitched, the sutures (catgut, silkworm gut, or silver) being passed from side to side of the incision—*i. e.*, through skin, pillar of abdominal ring, round ligament, pillar of ring, skin. The after-treatment is based on general principles." The patient must be kept in bed two or three weeks, and wear a vaginal pessary for several months. Says Byford:[1] "A drainage-tube to the bottom of the wound, and removed in twenty-four hours, is no hindrance to union by first intention, and avoids the retention of the sero-sanguineous oozing that always follows during the first few hours after the operation." This operative procedure is not unattended by danger, as a number of deaths have followed its performance. The results so far recorded are by no means of so encouraging a character as to render it likely that it will stand the test of time. I agree with the opinion expressed by Winckel[2] when he says: "The main objection to this operation will always remain this, that instead of the existing anomaly of position we produce another, as by the shortening of the round ligaments an abnormal fixation is effected; consequently, an anteversion is caused, eventually becoming an anteflexion. Whether this will permanently produce less annoyance than the retroflexion is doubtful." Again, in this operation the chief cause of retroflexio is entirely ignored; that is, the relaxation of the *retractores*. I must therefore concur in the views of Winckel, that it will not be long before this operation passes into oblivion.

Prolapse of the Vagina and Uterus.—Hypertrophy of the Cervix.

Historical.—Prolapse of the uterus came under medical observation at a very early period of time for reasons easily explicable. It is doubtless correct, as Winckel remarks,[3] that "the Grecian, Roman, and Arabian physicians manifestly identified dislocations of the uterus downward with inversions of the vagina." The displacements of the two organs are, however, so closely related that, though these writers may have betrayed an utter ignorance of anatomical knowledge, yet it must be admitted that many of the cases described under the name of procidentia uteri properly belong under this category. Hippocrates described it and discriminated several degrees. Celsus gives a curt notice of the affection. Soranus dedicates a whole chapter to prolapsus uteri, and refutes the erroneous views of his predecessors. He blames

[1] *Loc. cit.*, p. 534.

[2] *Loc. cit.*, p. 363.

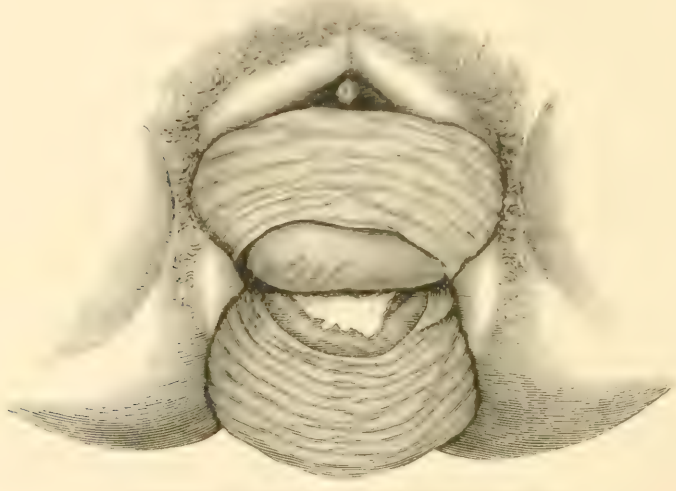
[3] *Lehrbuch der Frauenkrankheiten*, p. 279.

Euryphon for his treatment of prolapsus by suspending the patient for twenty-four hours by the feet to a ladder. He criticised also the methods adopted by those who fumigated the prolapsed uterus with ill-smelling substances—a practice predicated on the assumption that the uterus, like a living animal, retreated from bad odors. Soranus replaced the uterus by the finger in the proper position of the patient, and had the legs bound together. The retention of the organ was secured by a pessary constructed of wool dipped in a decoction of myrrh, etc. When the uterus became gangrenous in part or entirely, it was ablated to a corresponding extent. The accuracy of observation possessed by this author is shown plainly by the statement he makes in regard to the tumor formed by the prolapsus, that in the beginning it is reddened, but later becomes paler. Subsequently a retrogradation in the knowledge of this affection took place, as shown by the writings of his successors. Some of the methods used to replace the organ are very odd. Thus Rodericus à Castro advised that the prolapsus should be attacked with a piece of iron red hot, as if to burn it, whereupon the prolapsed part would recede into the vagina. Others bound mice and lizards to the prolapsed uterus, in order to force it by fright to replace itself. It is possible that these methods have occasionally been followed by the desired result, as the excitement and fright of the patient may at times have evoked reflex contraction of the smooth muscular fibres, and consequently the replacement of the prolapsus. The attempt on the part of the ancients to prevent the uterus from again prolapsing after it had once been replaced, by applying to the vaginal mucous membrane various medicinal substances with the view of restoring the lost tonicity of the parts, had a fair show of reason in it. But, as it was rarely successful, it is not surprising that efforts should have been made again and again to palliate the evil by mechanical means designed to retain the organ *in situ*. Hence the use of rings, spherical or egg-shaped bodies, tubes, and the like. A further step in the way of progress was exhibited by the effort to prevent the prolapse by operative procedures directed to the restoration of the lacerated perineum. Of late years a better knowledge of the pathological anatomy of prolapsus and the allied conditions has led to a revolution in our surgical methods by the development of kolporrhaphia anterior and of kolpoperineorrhaphy with its various modifications. In this development the names of Gustav Simon, Hegar, Sims, and Emmet are conspicuously pre-eminent. It is the indisputable merit of Huguier to have first emphasized the fact of the hypertrophy of the cervix uteri occurring in prolapsus, and to have shown that it is frequently the proper ground and primary cause of these conditions which have been united under the name of uterine prolapse.

Preliminary Remarks.—The subject of prolapse of the uterus is

an exceedingly complex one, and this becomes at once apparent when we proceed to classify the conditions grouped under this term. A systematic arrangement would include in this article only a consideration of descent and prolapse of the uterus in the strict sense of the term; but as this uterine displacement is rarely observed antecedently to vaginal prolapse, without involving the latter, and, moreover, as hypertrophies of the cervix are usually intimately associated with the clinical phenomena called into existence by prolapse, distinct though they may be from prolapse proper, it becomes almost a matter of necessity for convenience of study to comprehend under one category prolapse of the uterus and vagina and hypertrophic elongation of the cervix. The etiology of these conditions can only be studied profitably in connection with one another, and the symptoms, diagnosis, and treatment have much in common. Hart and Barbour[1] assert that the subject of prolapsus uteri has been made complex by erroneous terminology. According to their view, it should not be considered under affections of the

FIG. 454.



Prolapsus of Uterus and Vagina (after A. Martin).

uterus at all, and hence in their valuable manual it has a special chapter devoted to its study under the title "Displacements of the Pelvic Floor." To quote their language: "It is really a hernial displacement of part of the pelvic floor, in which the entire displaceable segment of the pelvic floor, uterus, and appendages are driven down by intra-abdominal pressure." For this decided innovation in terminology I do not think the reasoning of these authors sufficiently cogent, and shall retain the old term prolapsus.

[1] *Loc. cit.*, p. 533.

It is impossible to form a correct idea of the pathological anatomy of prolapsus if we do not possess an accurate knowledge of the normal anatomy of the pelvic organs. The reader whose anatomical knowledge needs to be refreshed would do well, therefore, to read the article on anatomy in the First Volume, and especially the paragraph on the pelvic floor. As supplementary to that description certain facts, anatomical and physiological, claim attention, and I beg here to acknowledge my indebtedness to the very excellent monograph of Walcher[1] for valuable material.

If investigation be made in regard to the mode of action of the muscular structures constituting the pelvic floor, it will be seen that when the levator ani muscle is relaxed the lower part of the rectum loses its acute angle, because the edge of the levator ani moves backward. When, on the other hand, this muscle contracts, it narrows the openings between its loops, and its anterior edge is approximated to the symphysis: it lifts up the rectum and posterior vaginal wall toward the pubic arch, and consequently lends to the vagina a very important support. The other muscles need no particular mention. In regard to the vagina, it should be borne in mind that it constitutes a direct continuation of the uterus—that its histological elements go over immediately and continuously into the corresponding layers of the vagina. The anterior vaginal wall may be looked upon as a connecting link fastening the uterus to the bony pubic arch. The folds of the peritoneum enclosing muscular elements, which are known under the name of retractores uteri of Luschka, sacro-uterine ligaments, utero-sacral ligaments, form a direct continuation of the chain of ligaments situated above the anterior vaginal wall to the sacrum behind. These muscular ligaments diverge from the uterus, so as to leave the rectum between them, in order to be inserted on the periosteum of the second or third sacral vertebra. A further fixation is obtained by the uterus through the bladder, the ligamenta lata, the ligamenta rotunda, and especially the peritoneum, which invests all these organs. Fritsch[2] denies the existence of the ligamenta pubo-vesico-uterine or vesico-uterine ligaments, although they have been demonstrated by all anatomists.

Two questions now present themselves for solution: What maintains the uterus and the vagina in their proper position? and how are they dislocated? The vagina possesses in front, by its attachment to the pubic arch, a firm point of support, while the sacro-uterine ligaments establish an indirect fixation to the opposite-lying pelvic wall, "which together," as Foster[3] expresses it, "constitute what may be termed a beam traversing the pelvis antero-posteriorly,"

[1] *Senkung und Vorfall der Scheide u. Gebärmutter.*

[2] *Die Lageveränderungen und Entzündungen der Gebärmutter*, p. 8.

[3] *Gyn. Transactions*, 1881.

and which has sufficient power to bear the uterus, the anterior fornix, and the bladder. The factors which maintain the vagina in position are divided into two categories—those which support the vagina, and those by which it is fixed. To the first belongs that assemblage of structures to which has been applied the term "apparatus for the closure of the vagina," as well as the pelvic floor, on which the vagina lies in nearly a horizontal direction when the woman is standing. To the second belongs an intact condition of vesico-uterine ligaments—the sacro-uterine as well as the broad and round ligaments; in fact, the entire peritoneum, which invests the organs lying on the pelvic floor with its reinforcements; and, finally, a firm union of the vagina with all its neighboring organ, and the pelvic connective tissue with its abundant fat.

Some observations upon the closure apparatus of the vagina are here in place, as in certain quarters of late its importance is depreciated. The lower part of the vagina is arranged so as to form a transverse figure, as Henle long ago pointed out, the anterior vaginal wall lying on the posterior, with the exception of a portion of the urethra, which lies outside of the subpubic ligament, and which may be termed the urethral prominence. The posterior commissure is, under normal conditions, lifted up so high toward the pubic arch that this urethral prominence, which fills up the upper angle of the arch of the pubis, is covered on its under surface by it. In consequence of the tonic contraction of the constrictor cunni muscle and the loops of the levator ani the posterior commissure is held up against the ligamentum arcuatum the more firmly, while in consequence of the action of the constrictor cunni superficialis the soft parts of the vulva are brought together to form a longitudinal fissure. The abundant supply of fat augments the functional activity of the parts to a very decided degree; and by no means unimportant is the deposit of fat found on both sides of the vulva on the inner surface of the thighs, which furnish a base on which the soft parts of the vulva are in part supported. Consequently, we perceive here an arrangement of such a character that two perpendicular guards are brought together to form a longitudinal fissure while at the same time closing the transverse fissure in front. The anterior vaginal wall rests on the posterior: its firm union to bladder in front and to uterus and retractores behind we have already sufficiently considered. The factors which maintain the vagina in its normal position subserve the purpose also of keeping the uterus in place. To a certain extent the uterus rests on the pelvic floor by its vaginal portion, but the chief means by which it is supported is the peritoneum with its folds and the parts covered by it, bladder and anterior vaginal wall, and which Walcher terms the peritoneal diaphragm.

Before proceeding to the subject of etiology it will be well to define the terms used. That condition in which the exploring finger finds the

vaginal portion nearer the vulva than is normal is designated by most writers as *descensus uteri*. It is generally observed in connection with retroversion or retroflexion. The position of the uterus when it has passed beyond the vulva is called *prolapsus*. By some writers the term "prolapsus" is applied to descensus as just described, while prolapsus as we have defined it is designated as "procidentia." Graily Hewitt applies the term "prolapsus" to both conditions, and we shall follow his example.

Etiology.—Prolapsus may at times be produced by the direct effect of injuries, and so have a sudden origin. By a blow on the abdomen, even under normal conditions, the uterus may be torn from its position by laceration of the folds of Douglas. It may arise from a fall from a considerable height on the buttocks or on the extended legs: the occurrence of this accident would be facilitated if the lower extremities were somewhat abducted, as in this way the support derived from the column of fat pertaining to the closed thighs would be lacking. Powerful exertion of the intra-abdominal pressure, as in lifting very heavy burdens and in persistent efforts at emesis, etc., have also been assigned as causes of the sudden development of prolapsus. Predisposing factors for such an acute origin are found in the condition of the vagina, uterus, and ligaments which prevails during the puerperal period; further, in retroversion, whether permanent or transitory; and in relaxation or defects of the pelvic floor. Prolapsus, however, as it generally comes under the notice of the gynecologist, is developed gradually; it has a chronic origin. We must seek the cause of prolapse in a relaxed condition of the ligamentous attachments of the uterus in the first place, and especially in a relaxation of the retractores. According to Schultze, the change in the uterine position caused by relaxation of the folds of Douglas leads to prolapsus of the anterior wall, not the reverse; it approximates the uterine insertion of the vagina to its pelvic insertion by one-half to one-third of its former distance, and consequently necessitates the anterior vaginal and adjacent vesical wall to bulge into the lumen of the vagina. When the uterus is retroverted in consequence of relaxation of its attachments, its vaginal portion is of necessity approximated to the vulva; and it is obvious that if the intra-abdominal pressure is intensified, provided the pelvic floor does not furnish an obstacle, it will not find it difficult to drive the anterior vaginal wall and the vaginal portion outside of the vulvar orifice. If the cervix and a portion of the bladder protrude beyond the vulva, the bladder contents will be exposed to the full effect of the intra-abdominal pressure, with its variations, while the inverted vagina and prolapsed part of the uterus are only subjected to the influence of atmospheric pressure. As a consequence, the wall of the bladder will follow the direction indicated by the point of least resistance, and will draw the wall of the

vagina attached to it downward, as well as the part of the uterus with which it is connected. The more complete the prolapsus the greater will be the effect of the intra-abdominal pressure acting on the uterus until the vagina is more or less entirely inverted.

As the puerperium furnishes a set of conditions favorable to the development of retroversion, it must also favor the origin of prolapsus. When retroversion occurs during the puerperal state the flabby bladder, which had been extended during pregnancy, will probably be found with a segment in the prolapsed vaginal wall, and in that event will aid in drawing down the uterus, because its contents are under the influence of the intra-abdominal pressure. In parous women, in consequence of the insufficiency of the closure apparatus, there is often a free communication of the vaginal wall with the atmosphere, and it, the uterus, and the bladder are exposed to the action of the intra-abdominal pressure under unfavorable circumstances, because now the counter-pressure from the vagina is lacking. Schultze believes that the chief reason why prolapsus does not take place when rupture of the perineum exists is owing mainly to the simultaneous existence of parametric fixations. It is demonstrated by ample clinical observation that women who belong to the poorer class who have to labor manually, and especially when the work is such as to call into action an augmentation of the intra-abdominal pressure from time to time, are much more liable to suffer from prolapsus than those more happily situated. In old age the prolapse is caused by atrophy of the muscular structures of the pelvic floor, and especially by disappearance of the fat from the buttocks, the thighs, and external genitals, with the result of rendering the closure of the vagina imperfect: every intensification of the intra-abdominal pressure affects the uterus and vagina in a one-sided way, and the uterus must now yield to the partial pressure.

In case of prolapsus of long standing there will be found, as a rule, elongation of the cervix. This phenomenon has been interpreted differently by different authors. By some it is considered the consequence of, by others the cause of, the prolapsus. Schultze believes that it is partly the effect of an hypertrophy, the cause of which must be sought in the manifold irritations affecting the prolapsed uterus; partly of the marked venous stasis, seldom missing; finally, in part, it is the effect of the traction to which the uterus is subjected in the longitudinal direction below by the vagina above by its normal attachments. The share of the two last-mentioned factors in the elongation is demonstrated by the clinical experience that after the replacement of the uterus a diminution in length occurs. Other authors, as especially Huguier and Schroeder, advocate the view that the hypertrophy of the cervix is the cause of the prolapsus. The latter believes that at first either the anterior vaginal wall only, or the anterior and the posterior walls together, prolapse

through the vaginal aperture in a downward direction. The vagina is attached above to the cervix, and hence in its prolapse it must exert a traction on the latter. If the uterus is attached to its neighboring organs in a normal manner, or if it is fixed in the pelvis pathologically by perimetric adhesions, tumors, etc., it does not follow the traction of the vagina, but gradually not only an elongation, but an hypertrophy, of the uterus is developed, so that the os uteri yields to the dragging-down action of the vagina, and descends deeper and deeper until it has passed the introitus and lies outside of the vulva, while the fundus occupies approximately or absolutely its normal position. These cases, according to Schroeder, should not properly be designated as prolapsus of the uterus, but, since the growth is confined almost exclusively to the cervix, should rather be called hypertrophies of the cervix. With still more frequency, in the opinion of Schroeder, complete uterine prolapsus is developed from cervical hypertrophy by the fact that the enlarged uterus undergoes diminution; the os uteri remains meanwhile in one position, but the fundus, with the diminishing size, descends more and more. The primary event in these cases is the vaginal prolapsus; it has, secondarily, elongation or prolapsus of the uterus as a sequel.

The proper etiology of these conditions must be sought in the vaginal prolapsus; and to attain to a clear idea of the uterine prolapsus we must ascertain the causes which evoke prolapsus of the vagina. How are we to reconcile these diverging views, on the one or the other side of which are ranged the leading gynecologists of modern days? The truth here, as in so many other scientific questions, will, I believe, be found to lie between the extremes. In the majority of cases the explanation given by Schultze is, I believe, in entire harmony with clinical facts, and consequently we must regard relaxation of the retractores as the chief cause of the prolapsus uteri, and hold that retroversio-flexio with descensus is the beginning stage of prolapsus. Barnes has advocated the claims of prolapsus of the uterus as a primary affection with his usual power and felicity of expression, but a part of his reasoning rests on false premises. He remarks: "One almost constant factor in prolapsus uteri is enlargement and increased weight of the uterus, which must necessarily destroy the balance between the forces that suspend the uterus and those that tend to drive it down. This correlation being destroyed, the uterus cannot but fall; and it is unnecessary to invoke an independent or superfluous force, such as the dragging down of the vagina." Provided the retractores are performing their functions normally, its increased weight and enlargement are not competent to dislocate the uterus backward; and this has been very fully demonstrated by the exact investigations of Küstner, to which reference has been made. On the other hand, there are cases observed

which can only be explained by the postulate that the vaginal prolapsus is primary and the descensus and prolapsus of the uterus are secondary. The causes potent in the production of vaginal prolapsus are essentially connected with the enlarged dimensions of the vagina, the relaxation of its walls, and a laxity of the peri-vaginal connective tissue. This state of things is found in the puerperium, as a rule. Even in pregnancy the vagina grows considerably in width and in length, so that, in spite of the fact that the upper portion of the vagina is usually drawn upward and backward by reason of the exaggerated anteversion, the lower part of the anterior vaginal wall protrudes from the vaginal aperture. Again, during pregnancy, according to the investigations of Von Hoffmann,[1] there takes place a very important change in the peri-vaginal connective tissue, consisting in the loss of its fatty tissue, in consequence of which it becomes looser and more displaceable, an exception being the attachment of the vagina to the bladder, which, in itself poor in fat, continues rigid and narrow. After childbirth there is often delayed involution; the vagina is longer and wider than it formerly was, and its walls exhibit a tendency to fall into folds. If now the intra-abdominal pressure is brought into action powerfully at frequent intervals, the pelvic organs will be forced toward the vaginal outlet, so that the lower portions of the vagina may protrude below, while on intermission of the pressure they will return to their normal place. Should, however, the intensified abdominal pressure be repeatedly exerted for a considerable length of time, they will remain permanently outside of the introitus, and gradually drag down the upper parts of the vagina and the lower portion of the uterus. The occurrence of the prolapsus is greatly facilitated by a wide vulvar orifice, as we observe it in parous women and after extensive perineal lacerations. The direction of the vagina and the angle which vagina and uterus form with each other have an important bearing on the strength of the traction which the prolapsing vagina exerts on the cervix. As we saw, the vagina lies almost horizontal in the upright posture of the woman when the vaginal-closure apparatus is performing its normal functions and the posterior vaginal wall has no inclination to prolapse, while the lower portion of the anterior wall has but a slight tendency in this direction, and the traction on the uterus, flexed forward and standing at an acute angle to the vagina, is reduced to a minimum. But when there is insufficiency of this closure apparatus partial prolapsus of the vagina will take place and the portio will be drawn forward, so that the uterus will be brought into a median position between normal and retroflexio, and either gradually or suddenly this intermediate position may be transformed into a retroflexion.

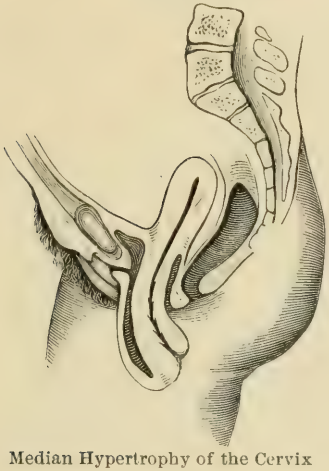
Elongation of the portio vaginalis can alone produce prolapsus. The

[1] *Zeitschrift für Geburt. u. Gyn.*, Bd. i. Heft 1. p. 146.

uterine body and the fornix vaginæ may retain their place in the pelvis. The interval between the external os uteri and the fornix vaginæ will then be very great, and displacement of the bladder and of Douglas' pouch may be completely absent. As the vaginal portion grows in length, it must of necessity take the direction in which there is the least resistance, and hence it will lie in the axis of the vagina; but this in turn will involve the necessity that the uterus shall also lie in this axis; consequently it will be exposed to the action of the abdominal pressure in such a favorable way that it will be driven downward, and at the same time inverting the vagina.

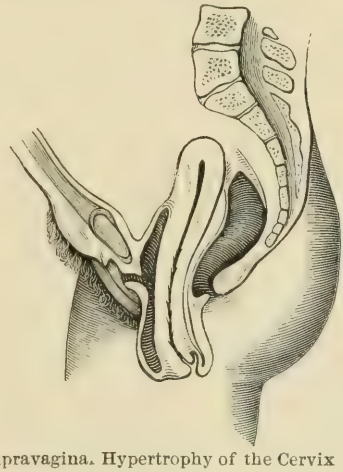
The supravaginal form of cervical hypertrophy exhibits different features. The interval between the external os and the insertion of

FIG. 355.



Median Hypertrophy of the Cervix (Schroeder).

FIG. 356.



Supravagina. Hypertrophy of the Cervix (Schroeder).

the vagina into the uterus is not increased. As the hypertrophied cervix descends it inverts the vagina, just as if the entire uterus were descending. With the descent of the supravaginal cervix of course the bladder, by virtue of its attachment, and the peritoneal investment of the Douglas' pouch for the same reason, must likewise move downward. The fundus may retain its normal place in the pelvis, but it is more frequently the case that the whole organ moves downward.

The isolated hypertrophy of the pars intermedia of the cervix offers a different condition corresponding to its anatomical peculiarities. For the correct understanding of these cervical hypertrophies it is important to adopt the views of Schroeder, and to regard the cervix, not as composed of *two* parts, the infra- and supravaginal, but of *three*, corresponding to the different attachments of the anterior and posterior fornix. Accordingly, the portion which is above the attachment of the posterior fornix is called the *supravaginal* part; that which lies beneath

the attachment of the anterior fornix, the *vaginal*; and the portion lying between, the *intermediate* part. When hypertrophy affects the intermediate part in a more or less isolated manner, the posterior fornix does not change its place to any marked degree, if at all, while the anterior escapes from the vulvar orifice. In this form rectum and Douglas' pouch may maintain their normal position, while the bladder and inverted anterior wall follow the prolapsing uterus. A glance at the illustrative figures will make these several conditions immediately comprehensible

Fig. 357.

Classification of the Cervix into Three Parts. P, Peritoneum; Bl, bladder; A, portio vaginalis; B, portio media; C, portio supravaginalis (after Schroeder).

Fig. 358.

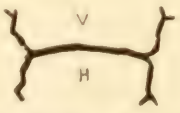


Figure of the Vagina in Transverse Section (Henle).

Pathological Anatomy.—A reference to the figure of a transverse section of the vagina, from Henle's great work, will serve to show that the anterior and posterior walls of the vagina lie in apposition, so that there is no gaping lumen. As an effect of this arrangement only the anterior or posterior wall will prolapse. When the vaginal closure-apparatus is insufficient, the anterior wall of the vagina is especially liable to prolapse, and with it the lower wall of the bladder, forming a cystocele, so called, according to the mechanism previously explained in which the intra-abdominal pressure plays a conspicuous rôle. When the rupture of the perineum extends to the anal opening, the posterior vaginal will be so inadequately supported as to have a tendency to prolapse. The descending posterior wall may be detached from the rectum and depend as a double fold between the loose connective tissue. Only in violent straining at stool will the rectum be driven into the prolapsing posterior wall. In other cases the posterior vaginal wall is more and more distended, and presents in front of the vulva, forming a rectocele, an effect due to the distended rectum, in which large quantities of fecal matter are apt to be found. The prolapsing vaginal mucous membrance is smooth, its folds are obliterated, the squamous epithelium is thick, the color becomes pale, and gradually an epidermis is formed. In the neighborhood of the os ulcerations are often seen. The os appears as a red transverse fissure at the lower end of the prolapsus. Proliferations of the cervical mucous membrane are frequently

observed. The portio is always very much thickened. When lacerations of the cervix exist there is usually extensive ectropium. The uterus lies in the inverted vagina, and when outside the vulva will be found strongly retroflexed. In very rare cases the prolapsed uterus has been found anteflexed. The entire uterus is generally swollen and its mucous membrane the seat of catarrhal inflammation. The posterior wall of the bladder follows the inverted vagina almost always. Farther above is the peritoneum at the bottom of the vesico-uterine excavation, behind the peritoneum of Douglas' pouch. The inversion of the vagina is hardly ever complete, a portion of the posterior wall not being involved. The prolapsus of the uterus also is very seldom complete, the upper part remaining in the pelvis. The urethra and bladder exhibit marked changes. The first is curved in a direction opposite to the normal one, bending downward into the prolapsus; in other cases it runs a short distance in the usual direction, and then bends abruptly downward. The bladder exhibits a complete change of form, as shown by the illustrations. The posterior wall is elongated to a very marked degree, extending from the inner os uteri down to the termination of the prolapsus. A long diverticulum will be found between the cervix and anterior vaginal wall, leading deep down into the prolapsus. The urine stagnates in this diverticulum readily, and may lead to catarrh of the bladder or even the formation of a stone. The catarrh may extend to the ureters and the pelvis of the kidneys. Distension of the ureters and hydronephrosis have been observed. The peritoneum, as a rule, shows but slight changes. Generally, the rectum does not project into the prolapsus by a large diverticulum, but in exceptional cases we find an enormous rectal diverticulum in which fecal masses and intestinal gases stagnate. The ligamenta lata are in the form of tense cords, while the ovaries and ends of the tubes are but little dislocated.

Symptoms.—The symptoms of acute prolapsus are intense abdominal pain, vomiting, phenomena of cerebral anæmia, retention of urine, and other signs of incarceration and peritonitis. In the chronic form of prolapsus, which develops in a gradual manner, the patients usually complain of a sensation of weight in the lower portion of the abdomen and a dragging feeling in the sacrum and inguinal regions. At times the symptoms are very insignificant. When prolapsus exists to any decided extent, urinary disturbances will not fail to manifest themselves, owing to the dislocation of the bladder and the stagnation of the urine in the diverticulum. At times the patient can void her urine only when she partially replaces the prolapsus. The symptoms undergo exacerbation from any exertion, as walking or long standing, after evacuation of the bowels or at the time of menstruation. The nervous system is sooner or later involved, and hence nervous dyspepsia, neur-

algias, and mental depression are often observed. A further group of symptoms owe their origin to the mechanical injuries to which the tumor is exposed from its position between the thighs. At first the uterus recedes spontaneously when the patient lies down at night, to prolapse after she has been on her feet for some time; in the course of time, in consequence of its increase of size, the prolapsus is permanent. Menstruation, as a rule, is not disturbed. The power of conception may not be prevented if the prolapsus can be replaced and there are no complications. If conception occurs, the uterus prolapses at first, but as pregnancy advances the increased size of the organ offers an obstacle to prolapsus.

The COURSE of the disease is an eminently chronic one. The condition becomes worse and worse if left to itself, until finally, owing to peritoneal adhesions or exudations in the pelvis, the prolapsus can no more be replaced.

DIAGNOSIS.—When a tumor covered by the vaginal walls lies outside of the vulva, at the bottom of which the os uteri is plainly perceptible, it is not difficult to recognize a prolapsus and to distinguish it from neoplasms or the inverted uterus. The diagnosis must, however, not stop here: all the related parts must be investigated in succession; consequently urethra, bladder, rectum, vagina, uterus, and peritoneal excavations must be accurately examined. For the examination of the urethra we can make use of an ordinary uterine sound or a catheter, and so ascertain the position of the urethra and the place where the bladder is to be found. By means of the finger in the rectum it is easy to recognize its relations to the prolapse of the posterior vaginal walls. As it is important to know the entire extent of the prolapsus, the patient must be required to bear down with force just before the examination is made.

In examining the vagina we ascertain, first, whether the anterior and posterior fornix are in their normal situation or whether they have been driven downward. In prolapsus of a marked degree the anterior fornix is obliterated. When the posterior fornix is levelled with the posterior commissure, it is either a case of complete prolapsus of the uterus or hypertrophy of the supravaginal part of the cervix. If the posterior fornix is approximately near the usual height, the intermediate portion of the cervix is hypertrophied.

The uterus can be accurately examined by manual palpation, which reveals the characteristic form of the uterus situated within the tumor with its fundus toward the base of the latter or extending into the pelvis. The vesico-uterine excavation reaches normally to the level of the inner os uteri, and therefore in hypertrophies of the cervix it is not altered. In actual prolapsus it descends, maintaining its normal relation to the uterus, into the prolapsus. The peritoneum of Douglas'

pouch will be found immediately behind the posterior lip, except in intermediate hypertrophy of the cervix.

TREATMENT.—Prophylaxis requires a careful management of the patient during childbirth, and especially during the puerperal state, in conformity with the principles of modern obstetrical science. Never should the obstetrician fail to subject his patient after her accouchment to an accurate examination, and even an insignificant rupture of the perineum should be immediately sutured. Any displacement backward should be treated at once. When prolapsus already exists, the first problem is to restore it to its normal position. It some cases it may be necessary to have recourse to the genu-pectoral position, or even anæsthesia, to eliminate intra-abdominal pressure. In slight cases we can shove back the fornix vaginæ and vaginal portion first, but when the prolapsus is very voluminous and the walls of the vagina rigid, the portion of the inverted vagina which came down last must be first reinverted. The reposition is completed, after the organ is brought back in the pelvis, by the aid of the hand manipulating through the abdominal walls.

After replacing the prolapsed uterus the next problem that confronts us is to keep it in its normal position or as near to it as possible. To fulfil this indication we must either have recourse to mechanical supports or else proceed to more radical measures and perform the operations of *elytrorraphia anterior* and *kolpoperineorrhaphia*, or, as they are also termed, *kolporrhaphia anterior* and *posterior*. Pessaries can only furnish palliative aid. The pessary which has given me most satisfaction in the treatment of the slighter forms of prolapsus, when the patients have declined the performance of an operation, is the Gehrung instrument. I can therefore recommend it in very highest terms. The Hodge pessary and its modifications are applicable to a very limited class of cases. Schultze's figure-of-eight and Thomas' pessary are useful in some cases. In cases of long standing, in which the patient's sufferings are very great, operative aid is imperatively demanded. Huguier recommended the ablation of the lower uterine segment, as, according to his view, hypertrophy of the cervix was the essence of prolapsus. Amputation is allowable only when the portio is very much elongated and under the circumstances to be mentioned hereafter.

I agree with the opinion expressed by Fritsch when he remarked in the preface to his book on obstetrical operations, "A textbook is no history of gynecological operations. It is better to learn a good method than to recapitulate all the procedures recommended in the course of decades." I shall limit, therefore, my description of operations only to a few, and first I shall mention Emmet's as affording most excellent results. His operation on the anterior vaginal wall he

thus describes: "I first antevert the uterus with my finger as the patient lies on the back. The neck of the uterus is then kept crowded up into the posterior cul-de-sac by a sponge probang in the hands of an assistant, while the patient is being placed on the left side for the introduction of the speculum. I then endeavor to find two points, one about half an inch from the cervix on each side, and a little behind the line of its anterior lip, which can be drawn together in front of the uterus by means of a tenaculum in each hand. When two such points can be thus brought together without undue tension, forming triangular-shaped folds, the surfaces are to be freshened. One of the tenacula must be securely hooked in the tissues to indicate the point. Then, one hand being disengaged, a surface half an inch square about the point of the other tenaculum is to be denuded with a pair of scissors. Next a similar surface is to be freshened around the point of the first tenaculum, and a strip afterward removed from the vaginal surface, in front of the uterus, about an inch long by half an inch wide. Having passed a needle armed with a silk loop beneath each of these freshened surfaces, a silver wire is to be attached to the loop and secured by twisting, thus bringing together in front of the cervix these three points, with the effect of forming a fold similar to, but somewhat smaller than, that formed by Dr. Sims' method. The chief advantages of this method, apart from its simplicity, are these: there is a loss of only a few drops of blood, and the neck of the uterus, at the beginning of the operation, can be secured in the cul-de-sac, and thus the hand of an assistant, which must necessarily be in the way, can be dispensed with. By the old operation the tissues forming the folds were drawn from behind and wrapped around in front of the cervix, while the chief support was from the column formed in the median line by turning in the redundant tissues below. By the method I have adopted a direct lateral support is gained from the pelvic fascia, giv-

Fig. 359.

Emmet's Operation for Procidentia.

Fig. 360.

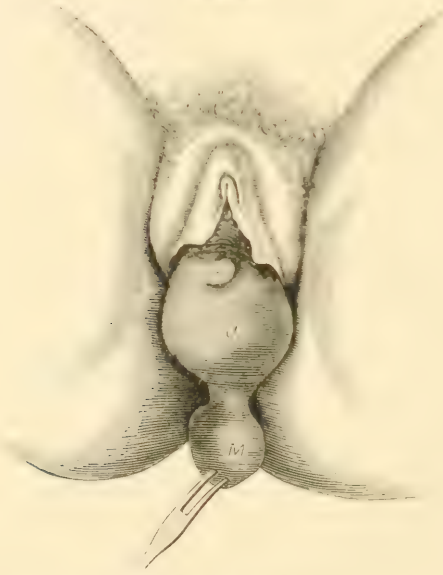
Folds formed after Twisting the First Suture (Emmet).

ing, in many cases, by this means alone, a sufficient support, entirely independent of the column to be afterward formed from the tissues turned in along the anterior wall. The completion of the operation after the cervix is thus fixed in position is very simple. The figure shows the two folds on the anterior wall in the shape of an ellipse extending from the surfaces secured in front of the uterus nearly to the vaginal outlet. These are to be turned in by finding with tenacula, from time to time, opposite points near the crest of each fold, which can be brought together without tension. With the object of preventing any unnecessary loss of blood, only half an inch on each side need be denuded at a time, one or more sutures being introduced and secured. Thus, advancing step by step, the operation is completed by turning in these folds until at length they become lost in the vaginal surface near the neck of the bladder."

Dr. Emmet completes his operative procedure directed to the relief of prolapsus by his operation on the posterior wall with the view of diminishing the size of the vaginal outlet. "The first step," he remarks, "is to seize with a tenaculum the crest of the presenting rectocele or the posterior wall of the vagina at a point where it can be drawn forward, without undue traction, to near the entrance of the urethra; and the instrument is then to be placed in the hand of an assistant, which is to rest above on the pubes. Then the operator is to hook up with a tenaculum the lowest caruncle or vestige of the hymen, and then bring the three tenacula together. When this has been done it can be seen at a glance what tissues are to be united together, as a crescentic line will be formed just within the vagina, running across its axis, with each horn becoming gradually lost in the sulcus on each side. The vaginal canal will be found reduced in size, the perineum will have been apparently drawn up toward the arch of the pubes, and the tissues at the previously gaping outlet will have been rolled in until the vaginal entrance is no longer larger than that of any female who has not given birth to a child at full term. . . . . If slight traction is made with the outer tenaculum while the tenaculum in the centre of the posterior vaginal wall is held above and in the median line, two triangular-shaped folds are at once formed by the apex of each being drawn out by a tenaculum, the upper angle running into the vaginal sulcus on that side, and the other one toward the skin, which would form the outer portion of the fourchette if it were intact. These two surfaces are the ones to be denuded and united." The other side is freshened similarly and sutured, and the centrally situated raw surface brought together by sutures, the first suture passing through each labium and the crest of the rectocele. The object sought to be attained is to restore the lost grasp of the pelvic fascia. It should be remarked that Dr. Emmet invariably includes in his operation for the relief of prolapsus

uteri a restoration of the cervix to its normal condition when laceration with ectropium exists. While Emmet's procedure is applicable to the majority of cases coming under the notice of the gynecologist, there are cases in which there is such redundancy of vaginal tissue and the hypertrophy of the cervix is so great that a more radical operation becomes necessary. Hegar's operation will then give good results, or, as I prefer, its modification by Schroeder[1]. This mode of procedure consists in partial amputation of the cervix, narrowing of the anterior vaginal wall, narrowing of the posterior with simultaneous closure of the rearmost portion of the pudendal cleft, consequently restoration of a strong perineal triangle. First of all, the two lips of the os are amputated according to Schroeder's method, previously mentioned. The posterior lip can be excised without danger of wounding the peritoneum, as a rule, because the fold corresponding to the reflection of the vaginal mucous membrane from the portio to the fornix vaginæ can be recognized. The anterior lip is obliterated, and the amputation must be

FIG. 361.



Prolapsus of the Inverted Uterus caused by a Small Myoma (after Schroeder).

made by a transverse section at the boundary of the lip, as ascertained by the touch; the lip is then detached for some extent from the bladder, and so excised toward the cervical canal that the first raw surface can be turned over upon the second and sutured.

The *kolporrhaphia anterior* consists in the excision of an oval piece from the mucous membrane of the anterior vaginal wall, and the union

[1] *Loc. cit.*, p. 200.

of the edges of the mucous membrane by suture. The piece to be excised must not be too small, and should extend from the urethral prominence to a point just in front of the anterior lip. The flap must be detached from its substratum by blunt dissection. To succeed in this the cut which defines the extent of the flap must penetrate through the entire thickness of the mucous membrane, old cicatrices only requiring the use of the knife. The clamp advised by Hegar and others can generally be dispensed with. After the raw surface is rendered smooth by the scissors we proceed to the application of sutures. The best method of coaptation of the corresponding parts of this surface is by the use of the continuous catgut suture. From extensive trial I am prepared to affirm with the utmost confidence that in plastic operations on the vaginal walls, uterus, and perineum we have in the juniper and chromicized catgut, employed in the form of continuous suture, a means of uniting freshened surfaces by primary union which leaves nothing to be desired. I concur heartily in the views advocated with such force by A. Martin in the October number of the *American Journal of Obstetrics* in regard to the value of the continuous suture, and with him "recognize in the continuous suture with catgut a great advance in the technique of gynecological operations." First, the deep parts of the wound are brought together, and gradually, tier on tier, we come to higher layers, until finally the incised surfaces of the mucous membrane are united by the continuous suture.

The *kolporrhaphia posterior*, according to the method of Schroeder, consists in freshening a portion of the posterior wall and the entire posterior part of the vaginal entrance. The freshened surface is irregularly rhomboidal in form, one angle extending up to some cms. beneath the highest edge of the fornix vaginæ. The angle opposite runs out toward the perineum, and is designedly made acute to avoid bulging when the parts are united. The two lateral angles run out laterally, curving slightly backward on each side of the vaginal entrance. The parts are united by the continuous catgut suture. In consequence of the excision of the posterior wall and the bringing together of the two lateral edges of the mucous membrane, the posterior vaginal wall is strongly bent forward, so that in the upright posture it forms a surface declining but little downward toward the narrowed vaginal aperture, anterior vaginal wall, and uterus resting on it.

A modified operation for amputation of the cervix and *kolporrhaphia anterior* was devised by this eminent surgeon. He incised the cervix on each side, amputated the posterior lip by excising a wedge-shaped piece: the *kolporrhaphia anterior* was then so planned that the anterior lip fell within the domain of the freshened surface and the upper point of the oval was made to lie in the cervical canal. At the same time the freshening must be made deeper on the place of the anterior

lip, otherwise the tension will be too great. As a matter of course, the operation should be conducted according to strict antiseptic principles. After the example of Neuber, Hofmeier, and others, I have found sterilized or distilled water preferable to a solution of carbolic acid or corrosive chloride for irrigating the wound while operating. If the operation has been an aseptic one, the after-treatment will be negative. In the perineoplastic part of the operative procedure designed for the relief of prolapsus I have for some years past been accustomed to operate according to the views advocated by Freund. Having regard to the mode of occurrence of lacerations of the perineum—which, as a rule, do not involve the columna rugarum posterior, but surround it from the sides—Freund did not freshen the middle part, but on both sides of the columna rugæ, more or less high up. The thought which guided me was the same as that which led Walcher[1] to develop his modified Freund perineoplastic procedure. "The fundamental thought," observes this author, "is the restoration of the *statu quo ante* through the reunion of parts belonging together after the most fundamental excision of all the cicatricial tissue, and sparing to as great a degree as possible sound parts of the mucous membrane." Müller, Bache McE. Emmet, and others in cases in which the prolapsus was complicated with uterine fibroids have performed laparotomy with extirpation of the uterus in order to heal the prolapsus radically by fixing the pedicle in the abdominal wound. Schroeder on several occasions when performing ovariotomy fixed the prolapsed uterus high in the abdominal wound by sutures. These operations have not proved satisfactory, and I can only assent to the judgment pronounced by Schroeder, that neither the total extirpation of the uterus from the vagina nor the supravaginal amputation by laparotomy is indicated for prolapsus alone.

Minor Displacements of the Uterus.

An extra-median position of the uterus usually has not much significance, unless due to a laceration extending into the parametrium. It is sometimes congenital. *Latero-versions* are generally due to peri- or parametric exudations, to pseudo-membranes, or to tumors which have dislocated the uterus to the right or left. They may be the consequence of defective development of the uterus: the uterus unicornis is strongly curved over the side. The uterus can be twisted around its longitudinal axis, constituting a *torsion*. This happens frequently when one of the folds of Douglas is affected by an inflammatory process, in consequence of which it is shortened. Of course tumors in its vicinity can produce distortion of the uterus and rotate it about its longitudinal axis under certain conditions. The *elevation* of the uterus

[1] *Loc. cit.*, p. 129.

is the result of other pathological conditions: myomata, extra-uterine sacs, ovarian tumors, or parametric exudations on the anterior abdominal wall can produce it. *Anteposition* of the uterus of a permanent character is generally caused by retro-uterine tumors. It is a notable symptom of retro-uterine hæmatocele. *Retroposition* is due, usually, to peri- and parametric processes. It is very seldom that the uterus enters a *hernial sac.* In fœtal life the uterus lies above the pelvis; an ovary or tube can therefore easily gain admission into the hernial sac and drag the uterus after it. The form of hernia is *inguinal.*

AUTHORS' INDEX.

A.

Abernethy, 215, 226
Ackermann, 272, 635, 973
Adams, 889, 1133
Adler, 383
Aeby, 955
Aëtius, 1091
Agnew, 140, 229, 245, 327, 383, 385
Ahlfeld, 53
Ainsworth, 530
Albers, 320, 919
Albert, 1046
Alexander, 340, 889, 1133
Alibert, 152
Allen, 1102
Alling, 452
Allingham, 444
Alquié, 1133
Ambrosoli, 365
Ameiss, 149
Amussat, 31, 388
Anderson, 239, 1021
Andral, 1028
Annandale, 245
Antal, 437
Aran, 706, 1133
Arnold, 297
Arnott, 554, 647, 670
Aronson, 781, 782, 1010
Ashhurst, 30, 52, 235, 245
Ashwell, 1033
Astruc, 175
Atlee, 328, 378, 557, 564, 575, 576, 591, 780, 790, 834, 1071, 1075, 1079
Aveling, 581, 694, 701, 703, 708, 709, 711, 712, 839

B.

Babes, 53
Baer, 660, 672
Bailly, 55
Bajarde, 53, 54
Baker, 168, 431, 631, 632
Balfour, 952, 954
Bamberg, 1031
Bandl, 178, 431, 897, 899, 903, 905, 921
Banks, 280, 311, 312, 317, 318, 1012
Bantock, 550, 583, 584, 587, 590, 592, 780, 784, 791, 793, 802, 810, 815, 817, 823, 827, 1017, 1020, 1035
Bar, 464
Barbour, 25
Bardenheuer, 620
Barker, 72, 83, 85, 95, 140, 609, 610
Barnes, 117, 118, 145, 155, 156, 160, 166, 167, 169, 170, 182, 371, 557, 592, 597, 642, 656, 670, 708, 709, 882, 909, 1141
Baroni, 373
Barrier, 715
Bartholemius, 154
Bartholini, 370
Barton, 256, 257, 441
Barwell, 352
Bassius, 356
Battey, 120, 173, 379, 836, 840, 842–844, 846, 848, 849, 909, 910, 912, 940
Bauchet, 360
Baudelocque, 175, 341, 698, 705
Baudier, 52
Baum, 791
Baumgarten, 1007
Bayles, 549
Beach, F., 182, 472
Beauchamp, 1024, 1025
Beaumont, 373
Beck, 215, 246, 354
Becquerel, 1030
Behier, 154
Behrend, 152–154
Beigel, 54, 341, 610, 848, 984, 1046
Beisone, 195
Bell, C., 210
Bell, J., 789
Bennet, I. H., 641, 642, 680
Bennett, J. M., 231, 239, 822
Berard, 349, 357, 359, 388, 436
Berbéze, 239
Bernard, 169
Bernays, 620
Bernutz, 909, 911
Bétrin, 634
Beuvin, 342
Beziehung, 155
Bidder, 47
Biercher, 365
Bigelow, 792, 793
Billroth, 24, 37, 201, 202, 204, 206, 207, 215, 228–231, 235, 237, 239, 241, 243, 245, 249, 253–256, 267, 271, 272, 274, 285, 294, 326, 352, 353, 359, 360, 566, 583, 586, 592, 1043, 1047
Binney, 89

Birch, 977
Birch Hirschfeld, 977, 1017
Bird, 1031
Birkner, 30, 211, 215, 245, 255, 261, 303, 329, 331, 334, 345, 349, 405, 506, 508
Bischoff, 41, 760, 767
Blair, 615, 616
Blasius, 469, 1021
Bloff, 980
Blum, 480, 490
Blumenbach, 1028, 1032
Blundell, 371, 618, 819, 909
Bock, 365
Bockenthal, 710
Bohn, 448
Boinet, 978, 1021, 1028, 1030, 1032
Bossier, 304
Boivin, 29, 697, 709, 856
Boldt, 37, 106
Bombaupt, 1012
Bonnet, 357
Boucher, 963, 986, 989
Bouchacourt, 328
Bougué, 389, 390
Bourdon, 198
Bourgeois, 29
Bowlby, 237
Boyer, 329, 698
Bozeman, 376–378, 387, 390, 407–409, 420, 424, 1114
Bradley, 599
Brady, 700
Brandt, 1127
Braun, C., 178, 632
Breisky, 24, 25, 27, 29, 31, 33, 46–48, 50, 51, 53–56, 195, 671, 1007, 1008
Bremer, 83
Brenecke, 525
Breschet, 382
Briddon, 196
Brissaud, 323
Broca, 215, 225, 261, 610
Brodie, 202, 211, 330
Brown, Baker, 42, 377, 378, 408, 557, 754, 809
Browne, 703, 705
Bruce, 339
Brückert, 194
Bryant, 201, 202, 207, 211, 215, 239, 244, 249, 261, 267, 277, 303, 317, 326, 823
Bryk, 202
Bucknill, 82
Budin, 642
Bull, 221
Bumm, E., 21
Burnier, 1021–1023
Busch, 382, 1052
Busey, 1079
Butlin, 255, 275, 317, 331
Byford, 389, 557, 576, 1132, 1134
Byrne, 632

C.

Cabral, 467
Cadiat, 261
Cailly, 629
Campbell, 430, 638, 888, 1124
Capuron, 99, 176
Cargnelier, 341
Carter, 30
Casals, 972
Castro, 1105
Caswell, 51
Cauwenberghe, 184
Celsius, 456
Celsus, 1134
Chadwick, 30, 591
Chamberlain, 127
Championnière, 317
Champneys, 195
Charcot, 96, 616
Charpentier, 17, 184, 716
Chenoweth, 1052
Cherreau, 980
Chéron, 849
Chiari, 24
Chrobak, 121, 962, 1118
Churchill, 380
Clark, A., 297, 938
Clarke, 371
Clay, 591, 790, 978, 980
Clemens, 1046
Clevenger, 660
Cloquet, 597
Clover, 24
Coats, 237
Coblenz, 828, 878, 969, 970, 972, 975–977, 1013, 1014
Coe, 1038
Coghill, 377, 378
Cohnheim, 208, 1034
Coley, 1035
Collard, 154
Colle, 363
Colley, 473
Collis, 379, 380
Colombat, 46, 597
Cook, 257
Cooper, Anthony, 456
Cooper, Sir A., 202, 206, 210, 215, 326, 328, 339, 341, 353, 357, 359, 365, 498
Cordier, 241, 242
Cornil and Ranvier, 215, 228, 231, 245, 255, 267, 277, 293, 359, 614, 616
Corradi, 389–390
Coste, 175
Courty, 381, 643, 705, 706, 714, 715, 1017, 1132
Courvale, 643
Coward, 1028
Coyne, 199, 212
Crampton, 694, 700, 705
Cras, 214, 221, 222
Credé, 48
Creighton, 203, 277
Cripps, 317
Crosse, 693, 694, 696, 697, 704, 705
Cruveilhier, 202, 214, 215, 217, 342, 348, 1030, 1032.
Curry, 788
Cushing, 620

Cutler, 472
Czerny, 620, 825

D.

Daviat, 475
Day, 50
Deboué, 380
Deffaux, 199
De la Barre, 705
Delpech, 372, 390
De Marquay, 52, 221, 326
Demme, 53
De Morgan, 207, 221, 222, 257, 260
Dempsey, 35
Denman, 175
Deroubaix, 372, 379, 418
Desault, 371
Deschamps, 56
De Schweinitz, 283
De Sinéty, 31, 41, 185, 595, 828, 872, 953, 982, 986, 990, 991
Desormeaux, 454
Desprez, 204, 317
Desvernine, 643
Deville, 24
Dewees, 647, 1091
Deyber, 371
Dezeimeris, 177, 178
Dickinson, 653
Dieffenbach, 29, 42, 320, 373, 374, 379, 380, 382, 436, 754, 790
Dieulafoy, 192
Dittrich, 894
Dohrn, 448, 449
Doléris, 626, 627
Donne, 21
Doran, 195, 801, 815, 822, 825, 827, 828, 878, 879, 954, 963, 965, 967, 969–971, 974, 981–984, 987, 990, 998–1000, 1005, 1007, 1009, 1013–1016, 1018, 1026, 1028, 1030, 1031, 1033, 1035, 1036, 1047, 1048, 1055, 1062, 1083
Doutrelepont, 275
Druitt, 1051
Drysdale, 996, 1076, 1077
Dubar, 358, 363
Dubois, 699
Duclout, 432
Dudley, 619, 683
Dufour, 52
Dugés, 29, 372, 856
Dumesnil, 557
Duncan, 19, 36, 453, 470, 487, 697, 699, 701, 754, 762
Duparcque, 745
Duplay, 206, 215, 241, 429
Dupuytren, 31, 372, 382, 390
Duret, 243
Durham, 237, 254
Durston, 342
Duval, 340
Dyrenfurth, 466

E.

Eberth, 977
Ebstein, 339
Eckhardt, 609
Edis, 19
Ehrhardt, 487
Ehrmann, 371
Eichwald, 993, 994, 1035
Ellis, 669
Elsässer, 204
Emmet, B. McE., 1152
Emmet, T. A., 26, 31, 36, 39, 42–45, 80, 168, 383, 385, 388, 391, 393–395, 397, 408, 416, 420, 425–430, 438, 441, 444, 455, 468, 473, 474, 476, 482, 484, 493, 518, 537, 578, 579, 597, 601, 602, 610, 611, 641, 643, 648, 661, 662, 681, 682, 708, 713, 717–719, 741, 754, 766, 767, 770–772, 774, 910, 927, 1103, 1105, 1113, 1121, 1123, 1124, 1127–1129, 1132, 1135, 1147–1150
Englemann, 23, 107, 592, 1121, 1127
Englisch, 477, 490, 491
Eppinger, 21
Erb, 146
Erichsen, 215, 245, 249
Esmarch, 280, 303, 315
Esquirol, 72, 82, 83, 87
Estlander, 253, 280, 296, 317
Etheridge, 627
Étiolles, 414, 415
Euryphon, 1135
Eustache, 825
Eve, 619

F.

Fabbri, 372
Fage, 642, 647
Farre, 17, 958, 959, 960
Fatio, 371
Faye, 893
Fehleisen, 353
Fehling, 46
Fenger, 620
Fenwick, 1063
Fergusson, 222
Fernbach, 982
Ferrus, 349
Fischel, 651, 987, 1016–1018
Fischer, 280, 294, 296, 333
Fisher, 647
Fisseaux, 479, 480
Fitzgibbon, 340
Flaischlen, 987, 1007, 1035, 1045
Flesch, 1035
Fleury, 46
Flint, 63, 106
Fochier, 267
Folet, 417
Follin, 231
Forget, 328, 329
Formad, H., 205, 216, 229, 230, 263, 271, 272, 274
Formento, 128
Förster, 211, 215, 224, 271, 275, 260, 909, 980
Foster, 1092, 1093, 1137

Foujen, 46
Foulis, 962, 964, 997
Fournier, 363, 364, 480
Fox, W., 968, 970, 972, 986
Franco, 456
Frank, 1051
Frankel, 53, 118, 195, 1031
Freer, 1083
Fremel, 610, 619, 620, 754, 855, 998, 1102, 1103, 1152
Frey, 1057
Friedländer, 1035
Fritsch, 515, 518, 545, 621, 625, 626, 766, 827, 986, 1004, 1037, 1048, 1053, 1096, 1097, 1103, 1108, 1117, 1130, 1137, 1147
Froriep, 339, 904, 909
Furst, 462, 991

G.

Gabbett, 878, 880
Gadsby, 331
Galabin, 651
Gallez, 1002
Gardner, 175
Gardner, 388, 1079
Garrigues, 676, 779, 825, 993, 996, 997, 1076–1078
Gartner, 1013
Gay, 250, 320
Gentrul, 52
Gerdy, 320, 373, 374, 380, 388
Gervis, 194
Gesell, 478
Getchell, 50
Gherini, 221
Giraldès, 1014
Glasgow, 114, 121, 122
Glätter, 602
Glück, 239
Gluge, 231
Godson, 155
Gooch, 1068
Goodell, 69, 70, 167, 168, 661, 754, 761, 779, 823, 881, 1075
Gordon, 190
Gorré, 339
Gosselin, 462
Gosset, 372, 375, 376
Gottschalk, 879
Goupil, 911
Gräfe, 46, 56, 57
Grammatikati, 54
Grandin, 29, 184
Green, J. H., 215, 839
Greene, 51
Greenhalgh, 194, 557
Greiner, 91, 92, 119
Greletti, 154
Gremler, 52
Greuser, 46
Griswold, 183
Gross, S. D., 30, 241, 245, 250, 342, 347, 348, 356, 540, 547
Gross, S. W., 201, 433
Grunewald, 56, 121
Grünfeld, 464
Guenther, 1086
Guerra-Aguirre, 555
Gusserow, 557, 596, 609–611, 615, 616, 637, 638, 977
Guthrie, 871
Gutierrez, 567
Guyon, 222, 463

H.

Hack, 118
Hagedorn, 40
Hahn, 431
Handyside, 340
Harmer, 585
Harris, A., 193, 433, 878, 1051
Hart and Barbour, 25, 33, 36, 54, 178, 182, 185, 451, 585, 693, 695, 704, 710, 730, 1097, 1099, 1100, 1121, 1124, 1133, 1136
Hauff, 194
Hauser, 53
Haussmann, 333
Haward, 249
Hawkins, C., 210, 215
Hayward, 374, 375, 379, 380
Heath, 246, 249, 456, 536, 591
Hecker, 178, 184
Hegar, 37, 38, 40, 41, 42, 44–46, 56, 58, 73, 76, 120, 436, 585, 586, 590, 618, 619, 637, 707, 754–757, 765, 766, 768–770, 780, 790, 819, 832, 840, 909, 912, 1080, 1135, 1150, 1151
Heilbrun, 433
Heine, 443
Heineke, 201, 221, 267, 280, 289, 291, 294
Heister, 341
Helbig, 340
Henke, 1091
Henle, 723, 960, 996, 1092, 1138, 1144
Hennig, 29, 185, 365, 619, 892–894, 900, 909, 910, 919, 921
Henoch, 547
Henrichsen, 36
Henry, 280, 285, 296
Henshell, 597
Heppner, 463–465, 468
Hermann, 51, 74, 102
Heschl, 1029, 1034, 1035
Heudoupe, 357
Hewitt, 1103, 1139
Hewson, 239
Hicks, 709, 1069, 1079
Hildebrandt, 20, 36, 195, 280, 289, 296, 576, 754, 757, 758, 762, 1021, 1043, 1118
Hilton, 50
Hippocrates, 71, 103, 369, 370, 557, 1091, 1134
His, 955, 1034, 1037
Hodge, 72, 1091, 1128
Hodgen, 105
Hofmeier, 195, 590, 602, 608, 610, 630, 1007, 1152

Hofmokl, 557
Holden, E., 72, 116
Holland, T., 101
Holländer, 1029
Homans, 791, 1052
Honori, 709
Hooper, 958
Hopkins, 220
Höppener, 333
Houel, 204
Howard, 1079
Hubert, 239, 244
Huckin, 705
Huguier, 456, 643, 1091, 1135, 1140, 1147
Hunter, 789, 1006
Huston, 342
Hutchinson, 284, 363
Hüter, 909, 1132
Hybord, 584
Hyford, 456

I.

Ill, 655
Image, 202

J.

Jackson, 454
Jacobi, Putnam-, 681
Jacquelot, 642
Jaffe, 126, 558
Janvier, 822
Janvrin, 177, 635
Jarvis, 454
Jeanselme, 388
Jenkins, 1052
Jenks, 19, 20, 34, 444, 1040
Jenna, 513
Jessop, 194
Jetter, 1059
Jewett, 183
Johnston, 58, 701
Johnstone, 190, 592, 593
Jourdan, 342
Jüngst, 257, 259

K.

Kaltenbach, 45, 58, 416, 437, 528, 590, 618, 619, 707, 780, 819, 832
Kaprersow, 452
Kaschewarowa, 53
Käser, 280, 296
Keith, S., 791, 792
Keith, T., 583, 585, 590, 592, 784, 801, 802, 804, 809, 816, 817, 823
Keyes, 363
Kidd, 155
Kieter, 619
Kilian, 374
Kimball, 812, 965
Kiwisch, 51, 185, 893, 894, 898, 909, 979, 1041, 1048, 1049, 1091
Klebs, 52, 204, 215, 245, 274, 320, 340, 470, 524, 550, 554, 637, 872, 880, 899, 974, 984, 1037, 1043
Kleinwächter, 35, 51, 1042
Klob, 51, 56, 549, 695, 699, 700, 701, 892, 908, 909, 980
Klotz, 285, 359
Kobelt, 1013
Koeberlé, 180, 194, 583, 586, 587, 591, 592, 808, 824, 834, 979, 1026, 1132
Kocher, 1035
Kocks, 448, 449
Kohlrausch, 1029
Kolessnikow, 359, 363
Kolisko, 973
Kölliker, 336, 341, 461, 464, 952, 964, 969, 987
König, 206, 214
Koster, 987
Kremer, 242
Kuhn, 1091
Kürz, 50
Kussmaul, 542
Küster, 201, 207, 280, 284, 296, 311, 312, 347, 318, 556
Küstner, 54, 513, 514, 1092, 1101, 1112–1115, 1123, 1141

L.

Labarraque, 342
Labbé and Coyne, 199, 206, 212, 215, 221, 222, 241, 245, 257, 258, 267, 321, 587
Lagrange, 243
Lailler, 154
Lallemand, 371
Lamballe, Jobert de, 373–376, 390, 414–416, 420, 421, 436, 754
Lambert, 1010
Lancereaux, 253, 364
Landau, 333, 431
Landreau, 364
Lane, 620, 806
Lang, 365
Lange, 202
Langenbeck, 42, 201, 202, 277, 618, 619
Langhans, 207, 270, 987
Lankester, 1012
Lannelongue, 215, 261
Lassen, 416
Lauenstein, 333
Lawrence, 320
Lawson, 324
Lawzi, 206
Laycock, 339
Lazarewicz, 195
Lazzati, 194
Leberdeff, 468
Lebert, 215, 231, 244, 261, 274, 320, 996, 1026
Le Blond, 41
Lebreton, 222
Le Cat, 160
Le Dentee, 348, 349, 358, 361
Lee, C. C., 681, 697, 698, 978, 980, 1041
Lee, T. S., 988, 1000, 1033, 1051.
Le Fort, 39, 41, 214
Leishman, 390
Leloit, 217

Lambert, 832
Lamnius, 537
Lamond, 347
Leopold, 183, 530, 620, 621, 624, 625, 873, 958, 963, 991, 1037, 1038, 1042, 1046
Lermoyez, 654
Leroux, 613
Leroux, 709
Lenkart, 24
Lever, 979
Levinius, 357
Levis, 50, 51
Levret, 429
Levy, 29
Lewin, 487
Lewzinski, 371
Leyden, 1118
Lichtenstein, 339, 340
Lisfranc, 382
Lister, 845, 911
Liston, 372, 588
Litzman, 195
Lober, 1021, 1023
Lochlein, 1131
Lombard, 29
Longyear, 661
Lorey, 550
Louis, 558
Louster, 338
Louvain, 177
Lucke, 245
Ludwig, 952
Luschka, 17, 335, 336, 971, 1112, 1137
Lusk, 79, 196

M.

McBurney, 177
McClintock, 52, 796
McDowell, 576, 789, 790
McGrew, 169
McGuire, H., 204
McWhorter, 661
Macan, 806
Mackenzie, 139
Madden, 655, 675, 695
Maisonneuve, 365
Malagodi, 372
Malgaigne, 462
Mallard, 682
Mann, 53, 168, 557, 590, 681, 1039, 1043
Manton, 793
Marandel, 338
Marcé, 71
Marchand, 239, 642, 973, 977, 987
Marignac, 206
Marin, 365
Marini, 325, 326
Markoe, 244, 498
Marsh, 51
Marshall, 331
Martin, E., 1102
Mattfeld, 194
Mattweff, 169
Mauriceau, 175, 370
Mayweg, 980
Meadows, A., 53, 380, 469, 578
Meckel, 166, 278, 321, 329, 1029, 1030
Medin, 333
Meier, 207
Meigs, 700, 1091
Meinert, 822
Meissner, 50, 715
Melassez, 139, 825, 872, 953, 982, 990, 991
Meredith, 795, 817
Merman, 470
Metteauer, 374
Metzinger, 1029
Metzler, 374–376
Meyer, C., 140
Michaelis, 417
Michel, 141, 142
Middleton, 467
Mikuliez, 825
Miller, 388
Miner, 830, 831, 1018
Mitchell, 444
Molesworth, 572
Mollinetti, 469
Monod, 215, 506
Monteils, 217, 342
Moore, 257–259
Morgagni, 356, 357, 490, 549
Mörike, 168, 468
Morris, J., 94, 260, 297
Morrison, 372
Morton, 262
Moschin, 1091
Mosler, 880
Moxon, 245
Müller, J., 210, 228, 231, 255, 277, 977, 1152
Müllerklein, 51
Mundé, 39, 661, 664, 681, 715, 788, 888, 1065, 1109, 1110, 1131
Murat, 340
Muriel, 221

N.

Naegele, 371
Nagel, 872
Nancrede, 232
Napier, 453
Negrier, 175
Negroni, 978
Neisser, 21
Nélaton, 29, 359
Nepveau, 1010
Netzel, 195, 974
Neuber, 1152
Neugebauer, 52, 53, 421
Neumann, 260, 277
Newman, 434
Nicolaysen, 762
Noeggerath, 21, 458, 715, 788, 868, 880, 910, 914, 982
Norton, 528
Nousse, 838
Novaro, 194
Noyes, 140
Nunez, 463, 464, 467
Nussbaum, 790, 812, 826, 978, 1000

O.

Ogston, 536
Ohnacker, 358, 361
Ohr, 73
Oldekop, 280, 289, 291, 294, 296, 297
Oldham, 596
Oliver, 469, 473
Olshausen, 54, 620, 694, 816, 834, 855, 870, 872, 874–876, 882, 958, 959, 963, 969, 977, 978, 987, 1000–1002, 1004, 1005, 1007, 1008, 1016, 1021, 1022, 1026, 1029, 1031, 1035, 1043–1046, 1051
Owen, 317

P.

Paget, J., 52, 205, 207, 215, 221, 231, 253, 255, 261, 283–285, 300, 310, 324, 609, 623
Pallen, 518, 642, 663, 681
Palmer, 22, 824
Pancoast, 379
Paquelin, 518
Paré, A., 41, 175, 370
Parker, R., 204, 207, 257, 267, 284
Parkinson, 591
Parry, 178, 185, 1001, 1057
Parvin, 39, 57, 430
Patruban, 1001, 1006
Patenko, 860, 870, 877, 983, 1040
Pauley, 155
Pauli, 154
Paulinus, 340
Pawlick, 431, 459
Péan, 241, 255, 258, 260, 283, 585, 591
Peaslee, 395, 906, 910, 965, 978, 979, 1007, 1043, 1050, 1067, 1068, 1070, 1073, 1081
Pelletan, 51, 52
Pepper, 106
Perls, 215
Peter, 267
Petit, 371, 383, 464
Peyrot, 642
Pflüger, 952–954, 982, 984, 986, 987
Phillips, 473
Phocas, 354, 355
Pick, 239, 245, 317
Pitha, 239, 245
Playfair, 642
Ploucquet, 1030
Polaillon, 317, 417
Polk, 620, 627, 628, 648, 656, 681, 1133
Pollak, 182
Poncet, 324
Porak, 57
Porro, 52
Post, S. E., 239, 627
Pott, 838, 843
Potter, 1027
Powers, 452
Price, J., 195, 721, 791
Prochownik, 37
Puech, 29, 30, 340
Puls, 220
Puzos, 697–699

Q.

Quackenbush, 716
Quenu, 811

R.

Raciborsky, 175
Raffäle, 389
Rampoldi, 141, 142
Ranney, 1092
Ranvier, 215, 229, 231
Rayer, 473
Reamy, 38, 168, 644, 680
Reboul, 1024, 1025
Récamier, 37, 598, 619
Reclus, 323
Reed, 489
Reeve, 693, 695, 701
Reeves, 454
Reid, 491
Reineck, 1090
Reinhardt, 211
Reiss, 1049
Remak, 462
Rendu, 705
Renouard, 29
Reverdin, 239
Rey, 46
Reynolds, 434
Richard, 1021, 1023
Richardson, 509, 679
Richelot, 324, 326, 328, 626
Richet, 207, 284
Richolot, 1132
Richter, 371
Ricord, 479
Riedel, 250, 253, 280, 296
Rigby, 647
Rindfleisch, 215, 256, 275, 962, 970, 980, 981, 994, 1033
Ritchie, 961, 982, 1026, 1032
Rizzoli, 333, 373
Robin, C., 17, 225, 241
Robinson, W., 801
Robiquet, 456
Roche and Sanson, 372
Röderer, 175
Römer, 978, 1026
Rogeau, 321
Röhrig, 1005
Rokitansky, 23, 255, 506, 699, 893, 894, 905, 960, 961, 963, 982, 1003, 1007, 1021, 1023, 1031, 1040, 1041, 1043
Roper, 202
Rose, 201, 280, 283, 461, 470, 479
Rosenbach, 807
Rosenberger, 1001
Rosenstern, 215, 223
Rosenthal, 452
Roser, 421
Roubeaud, 30
Rouget, 952, 955
Routh, 1031
Roux, 42, 372
Rückard, 637
Rückenlage, 401
Rufus, 357

Rose and Veit, 87, 602, 603, 605, 606, 610, 612
Rosenals, 39
Rosenberg, 444
Rydygier, 620

S.

Safford, 1041
Sager, 789
Sainthill, 848
Salter, 1030
Sanctis, 146
Sangalli, 1048
Sanger, 53, 764, 761, 763, 764, 895
Sappey, 17
Sarranti, 634
Satterthwaite, 217
Sauer, 618, 619
Sauterson, 340
Savages, 564
Savage, L., 17, 795
Saxinger, 558, 616
Scanzoni, 52, 584, 492, 718, 803, 894, 909, 962, 978-980, 995, 1049, 1105
Scarpa, 329
Schatz, 469, 719, 730
Schetelig, 1132
Schlegtendal, 524, 528
Schmidt, 957, 998
Schnabel, 1030
Schneidemuhl, 1024
Schramm, 154
Schreger, 371
Schroeder, 26, 40, 42, 44, 55, 57, 58, 76, 79, 84, 168, 195, 487, 560, 563, 568, 583, 587, 588, 590, 592, 602, 618, 620, 630, 631, 663, 679, 791, 794, 834, 963, 1004, 1008, 1009, 1035, 1037, 1042, 1046, 1049, 1052, 1098, 1100, 1105, 1108, 1118, 1123, 1127, 1129, 1133, 1140, 1141, 1143, 1144, 1150, 1152
Schuh, 221, 289, 320
Schuller, 448, 449
Schultz, 553
Schultze, B., 855, 891, 1091, 1096, 1101, 1104, 1106, 1108, 1109, 1113, 1118, 1122, 1125, 1126, 1129, 1130, 1139, 1140, 1141
Schulze, F. E., 275
Schumarbeck, 487
Schuppert, 373, 400, 436
Schwartz, 1052
Schweighauser, 1091
Scott, 194
Sée, M., 317
Senfleben, 524, 528
Shaw, 707
Sigmund, 485
Simmonds, 275
Simmons, 53
Simon, G., 42, 44, 203, 376, 377, 387, 390, 391, 395, 401-409, 416, 420, 421, 424, 430, 433, 436, 438, 456, 458, 459, 529, 537, 754, 765, 766, 825, 1135
Simonin, 456
Simpson, A. R., 26, 45, 53, 378, 417, 641, 718, 762, 892, 893, 895, 976, 1000, 1008, 1091
Simpson, Sir J. Y., 601, 730
Sims, 40, 41, 69, 42, 148, 475, 477, 581, 583, 588, 590-595, 598, 601, 815, 909, 915, 972, 975, 982, 983, 1004, 1091, 1100, 1123, 1125, 1135, 1148
Sinety, 694
Skae, 799
Skene, 53, 54, 448, 464, 465, 480, 481, 489, 517, 791
Slavjansky, 859, 860, 877
Sloan, 601
Sloan, 267
Smellie, 175
Smith, A., 158, 1128
Smith, Heywood, 194, 444
Smith, J. Greig, 196, 859, 997, 1038, 1069, 1072, 1076, 1081-1083
Smith, Tyler, 697, 708, 919
Snow, H., 298
Socin, 280
Sorg, 457
Soltmann, 53
Soranus, 1134
Spath, 40, 178
Spiegelberg, 53, 54, 194, 416, 417, 705, 987, 993, 1016, 1017, 1037, 1038, 1047, 1077
Sprengel, 277, 280, 289, 291, 294, 296, 297
Stadtfeldt, 105
Stanley, 253
Startin, 377
Staude, 754, 758, 760
Stein, 627
Steiner, 29
Steller, 154
Steudener, 267
Stilling, 207, 237, 254
Stoltz, 39
Storer, H., 83, 591
Stratz, 617
Stroinski, 529
Strong, 368
Sutton, 661, 683, 688
Sutugin, 47
Sweeney, 700
Syme, 372

T.

Tait, L., 178, 193, 195, 550, 552, 566, 580-584, 589, 590, 782, 783, 791, 792, 802, 810, 814-817, 820, 823, 824, 840, 866, 874, 904, 909-912, 938, 941, 954, 961, 962, 975, 982, 983, 1003, 1005, 1006, 1017, 1018, 1037, 1043, 1044, 1051, 1062, 1069, 1075, 1078, 1081, 1084-1087
Talamon, 881
Tarnier, 642
Tate, J. H., 705, 706, 715
Tauffer, 621, 826
Taylor, I. E., 30, 442, 697, 698
Teale, 709
Terrier, 827
Terrillon, 257, 489, 651, 1004

Thatcher, 695, 705
Thiersch, 24
Thomas, C. H., 653, 670
Thomas, T. G., 19, 21, 24, 30, 36, 39, 225, 428, 549, 553, 557, 566, 576, 578, 586, 590, 597, 598, 643, 660, 697, 698, 704, 706, 707, 709, 910, 911, 979, 1001, 1017, 1038, 1051, 1074, 1087, 1097, 1124
Thompson, 811
Thompson, Sir H., 515
Thornton, K., 784, 791, 793, 802, 810, 816, 817, 822, 823, 967, 997, 1004–1006, 1008, 1035
Tillaux, 206, 239, 241, 317, 1133
Tilt, 37, 61, 70, 72, 76, 125, 152, 155, 980
Török, v., and Wittelshöfer, 292, 294, 296–298
Trask, 29
Tratzl, 51
Trélat, 317, 642
Treves, 823
Tripier, 121, 202, 215, 223
Tuke, 71, 82

U.

Ultzman, 487, 503, 510, 515, 529, 540, 544, 545, 547
Unverricht, 1035
Urdy, 591

V.

Valentin, 715, 952, 954
Valude, 244
Vancher, 634
Van de Warker, 632, 1092
Van Döveren, 52
Van Roonhuysen, 370, 371
Van Santvoord, 682
Vedeler, 195, 1100
Veit, 56, 978, 1007, 1023
Velpeau, 175–177, 202, 215, 261, 289, 320, 325, 354, 357, 359, 388, 415, 436, 558
Verneuil, 204, 244, 315, 317, 326, 348, 365, 491
Viardel, 709
Vidal, 345, 347, 436
Virchow, 52, 56, 68, 209, 214, 215, 228, 231, 245, 255, 257, 259, 260, 275, 322, 342, 348, 349, 472, 491, 549, 550, 557, 560, 574, 575, 635, 868, 870, 872, 877, 957, 980, 1030, 1037, 1047–1049
Voche, 909
Vögtlein, 532
Voigtel, 549
Volkmann, 280, 330
Volpi, 329
Völter, 370
Voltolini, 118
Von Gräfe, 139
Von Hacker, 205
Von Hoffmann, 1142
Von Massari, 473
Von Preuschen, 56
Von Siebold, 709
Voos, 754, 761, 762
Vulliet, 633, 634

W.

Wagner, 154, 274, 894
Wagner, 601, 609, 909
Wahl, 1035
Walcher, 1137
Wacker, 202, 255
Waldeyer, 207, 269, 270, 274, 284, 950–954, 956, 968, 976, 982, 984–986, 988–990, 1012–1015, 1033, 1042, 1043
Warren, 202, 700
Watkins, 1131
Watson, 223, 242
Watt, 57, 715
Webb, 961
Wedl, 491
Weil, 1002
Weist, 700
Wells, 721, 780, 790, 791, 802, 813, 815–817, 824, 961, 982, 995, 1000, 1003, 1006–1009, 1017, 1021, 1035, 1041, 1053, 1062, 1078, 1080, 1083, 1085
Wernich, 925
Werth, 40, 44, 751, 974, 999, 1000, 1012
West, 487, 610, 638, 694, 698, 978
Westphalen, 993
White, J. P., 19, 20, 708, 709, 711, 712, 1055
Whitney, 547
Wiedt, 529
Wildt, 456
Wilhelm, 154
Wilks, 245
Will, 341
Williams, J., 195
Wilson, C. M., 661
Wilson, Elwood, 679
Wilson, H. P. C., 51, 152, 195, 795, 815
Wiltshire, 1006
Winckel, 47, 56, 245, 255, 267, 284, 454, 459, 484, 487, 490, 491, 494, 499, 515, 534, 546, 557, 594, 694, 695, 791, 854, 866, 881, 889, 892–894, 899, 900, 925, 926, 1054, 1091, 1111, 1120, 1134
Winiwarter, V., 280, 289, 291, 294, 296, 297
Winslow, 244
Wittelshöfer, 292, 294, 296–298
Witther, 372
Wittich, 452
Wolff, 1012
Wood, 277
Woodson, 700
Wresham, 534, 536, 538
Wücher, 47
Wutzer, 373, 436
Wylie, 646, 681

Y.

Youkin, 791
Yvaren, 365

Z.

Zambianchi, 239, 243
Ziegler, 215, 275, 505, 878, 1028
Zweifel, 433

INDEX TO VOLUME II.

A.

Abortions, a cause of laceration of cervix, 644
Abscess of breast, cold, 361
Acne, reflex dermatosis, 155
Adenitis and periadenitis of breast, 349
Adenoid growths of uterus, 592
  cancer of ovary, 1043
Adenoma cylindro-cellulare cysticum, 964
  of breast, 261
Alexander's operation for lacerated cervix, 673, 1133
Alveloz, milk of, in treatment of uterine cancer, 635
Alveolar or endothelial sarcoma of breast, 229
Amazia, 338
Anæmia, progressive, as a symptom of uterine tumor, 565
Anæsthetics, in ovariotomy, 802
Anatomy of the breast, 335
Angioleucitis of breast, 349
Anteflexion of uterus, 1100
Anteversion of uterus, 1096
Aphthous vaginitis, 49
Apoplexies of breast, 348
Appetite, perverted, a gastro-neurosis, 134
Ascarides causing vaginitis, 20
Ascites, a complication of ovarian fibroma, 1042–1059
  complicating ovariotomy, 826
Atresia of hymen, 25
    causing pelvic hæmatocele, 26
      peritonitis, 26
    prognosis of, 26
    symptoms of, 26
    treatment of, 26
  of urethra, congenital, 464
  vaginæ, 26
Atrophy of the bladder, 522
Aveling's method of replacing inverted uterus, 711

B.

Bacteria of vaginitis, 21
Baker's method of excision of uterus, 631
Barnes' treatment of chronic inversion of uterus, 708
Barrier's method of reducing inverted uterus, 715
Battey's operation, 837
Billroth's method of treating pedicle, 586
Bladder and urethra, diseases of, 447
    methods of examination and diagnosis, 452
  anatomy and histology of, 447
  atrophy of, 522
  calculi of, 533
  carcinoma of, 524
  cysts of, 525
  diseases of, 496
    cystitis, 504
      classification of, 504
      diagnosis of, 511
      etiology of, 506
      pathological anatomy of, 505
      prognosis of, 512
      symptoms of, 508
      treatment of, 512
    cystocele vaginalis, 498
    fissure of vesical neck, 519
    hyperæmia, 502
    hypertrophy, 521
    inversion, 500
  embryology of, 459
  foreign bodies in, 529
      from without, 529
  hyperæmia of, 502
  hyperplasia of, 523
  hypertrophy of, 521
  irritability of, 538
    as a symptom of uterine tumor, 564
  malformations of, 496
  neuroses of, 538
    etiology of, 538
  papilloma of, 524
  prolapse of, 500
  sarcoma of, 524
  tuberculosis of, 522
  tumors of, 523, 524
Blepharo-marasma, 156
Blundell's operation for carcinoma uteri, 618
Bowels, fatal obstruction of, following ovariotomy, 822
Bozeman's method of operating for vesico-vaginal fistula, 407
Breast, abscess of, cold, 361
  anatomy of, 335
  apoplexy of, 348
  atrophy of, 344
  burns of, 346
  calcareous concretions in, 347, 356
  congenital defects and excesses of, 338
  cystic tumors of, 200

Breast, development of, 335
diseases of, 197, 335
acute engorgements, 348
acute inflammatory affections, 349
chancre, 362
chronic mastitis, 353
treatment of, 356
cold abscess, 361
injuries of, 345
irritable mammæ, 365
lupus, 362
mammary fistulæ, 357
mastodynia, 365
mazodynia, 365
neuralgia, 365
nipple and areola, 344
other than tumors, 335
secondary syphilis, 363
sympathy with other organs during, 368
syphilis, 362
tertiary syphilis, 364
tuberculous mammæ, 358
engorgements of, 348
erysipelas of, 351
fibroma of, 215
fistulæ of, 357
foreign bodies in, 347
histology and development of, 335
hypertrophy of, 341
injuries and wounds of, 345, 346
irregular or abnormal secretion of milk in, 341
reflex symptoms of, 162
sarcoma of, 226
tumors of, 197
adenoma, 261
anatomy of, 209
carcinoma, 268
atrophying scirrhus, 307
colloid, 274, 305
connective tissue or fibrous, 271
cystic, 276
fibrous or connective tissue, 271
medullary, 303
multicellular, 274
scirrhous, 271
classification, 198
cysts, 320
connective tissue or lymphatic, 330
glandular or retention, 320
hydatid, 332
developments of, 202
fibroma, 215
myxoma, 255
sarcoma, 226
Broad ligament, cysts of, 1012
Bronchi, hystero-neuroses of, 117
Browne's treatment of chronic inversion of uterus, 707

C.

Cachexia in uterine cancer, 616
of carcinoma, 298
Calcareous concretions in breast, 347–356
Calcification of fibroids of uterus, 557
of uterine fibroids, 557
Calculi, vesical, 533
Campbell's method of replacing prolapsed ovary, 888
Cancer of the cervix, 607
of the ovary, 1043
of the uterus, 601
caustic treatment of, 632
Cancerous cachexia, 298
Cancroid of the vagina, 54
Carcinoma, infectious nature of, 292
of bladder, 524
of breast (see also *Tumors of breast, Carcinoma*), 268
of Fallopian tube, 893
of the vagina, 54
uteri, 601
diagnosis of, 617
etiology of, 609
operations for, 618–620
pathology of, 602
symptoms of, 611
treatment of, 618–634
Cardiac reflex neuroses, 104
Caruncle, urethral, 491
Catamenia, reflex dermatoses in, 151
Catarrhal vaginitis, 19
Catheterization in paralysis of bladder, 544
Catheters, self-retaining, 517
Caustic treatment of uterine cancer, 632
Cellulitis of breast, 349
Central reflexes, 82
Cerebral hystero-neuroses, 82
Cervix, hypertrophy of, 1134-1140
lacerations of, causing retro-displacements of uterus, 1114
uteri, cancer of, 607
cystic degeneration of, 651
erosions of, 651
lacerations of, 641 (see also *Lacerations of cervix uteri*).
Chancre of the breast, 362
Change of life, artificial (Battey's operation), 837
Childbearing a cause of cancer of uterus, 618
Chlorosis, with anteflexion, 1109
Cholesterin in ovarian cysts, 996, 1082
Chondroma of ovary, 1048
Circulation, hystero-neuroses of, 103
Circulatory reflexes, 103
Cocaine in vaginitis, 22
in vomiting of pregnancy, 79
Coition, excess of, causing vaginitis, 20
Cold abscesses of breast, 361
Colloid cancer of ovary, 1043
carcinoma of breast, 274, 279, 305
Colpitis, 19
Colporrhaphy, 38
anterior, 39
Hegar's operation, 40
Leon le Fort's operation, 41
Sims' and Emmet's operation, 40
posterior, 42
Emmet's operation, 42

Colporrhaphy, posterior, Hegar's operation, 44
Constipation, hystero-neurotic, 137
Courty's method of reducing inverted uterus, 714
Cyst, ovarian, papillomatous, 968–975
Cystic carcinoma of breast, 276, 279
changes of adenomata, 264
degeneration of cervix uteri, 651
of fibroids of uterus, 559
tumors of breast, 200, 320
Cystitis, 504
decomposition of urine, 507
from catheterization, 507
from exanthemata, 507
Cystocele, 37
vaginalis, 498
Cysto-fibroma and fibroma of ovary, 1036
Cystoid myxoma, 257
Cystoma carcinomatosum, 1043
accidental changes in, 1055
complications of, 1058
multilocular ciliated, of ovary, 968
ovarian, 1050
proliferating glandular, of ovary, 964
papillary, of the ovary, 968
symptoms of, 1052
termination of, 1054
Cystospasmus, 538
Cystotomy, hypogastric, 538
vaginal, 537
Cysts, dermoid, of ovary, 1025
follicular, of ovary, 957
multilocular ovarian, 964
of breast, 320
of broad ligament, 1012
of Fallopian tubes, 893
of ovary, dermoid, 1025
follicular, 957
of parovarium, 779
of vagina, 56
treatment, 58
ovarian, development and histogenesis of, 980
diagnosis of, 1073, 1078
parovarian, 1012
tubo-ovarian, 1020
urethral, 490
vesical, 525
Czerny's method of operating for cancer of uterus, 620
operation for carcinoma uteri, 620

D.

Degeneration of uterine fibroids, 556, 557, 559
Dermatoses, 151
Dermoid cysts, 1082
of ovary, 1025
Development of the breast, 335
Diarrhœa, hystero-neurotic, 137
Diet after ovariotomy, 820
Differential diagnosis of ovarian tumor, 1069
Diphtheritic vaginitis, 19
Dislocations of the bladder, 496
of the urethra, 481
Displacements of uterus, 1091
of vaginal walls, 37
Douche, hot water, and antiseptics in treatment of lacerations of cervix, 675
Douches, vaginal, hot, in treatment of prolapse of ovaries, 887
Drysdale's cells, 996
Dysmenorrhœa as a symptom of uterine tumor, 565
Dyspareunia, a symptom of prolapse of ovary, 884
Dysuria, 483

E.

Ectopic pregnancy, 175
Eczema of nipple, 344
Electricity in extra-uterine pregnancy, 192
in paralysis of bladder, 544
in treatment of prolapse of ovaries, 890
Elytritis, 19
Elytrorrhaphy, 38
Embryology of bladder and ureters, 459
Emmet's method of reducing inverted uterus, 713
operation for posterior colporrhaphy, 42
for prolapse of uterus, 1147
for relaxation of perineum, 770
for repair of perineum, 770
uterine repositor, 1124
Entero-vaginal fistula, 439
Enuresis, nocturna, diurna, continua, 545
Episiostenosis for cure of urinary fistulæ, 436
Epispadias, 463
Epithelioma, complicating lacerations of cervix, 662
of urethra, 490
Erosions as cause of carcinoma uteri, 611
of cervix uteri, 651
Erysipelas of breast, 351
Extirpation of uterus per vaginam, 620, 625
Extra-uterine gestation, 175
causes of death, 189
course and terminations, 182
definition and symptoms, 176
diagnosis, 181, 188
duration, 184
etiology, 179
history, 175
mortality, 185
pathological anatomy, 180
physical signs, 187
symptoms, 186
table of primary laparotomies, 194
treatment, 189
varieties and frequency, 176, 178
Eye, hystero-neuroses of, 139

F.

Fallopian tubes, development and anatomy of, 920

Fallopian tubes, diseases of, 877
hemorrhage into, 896
hypertrophy of, 896
neoplasms of, 924
benign, 932
malignant, 893
Fatty degeneration of uterine fibroids, 536
Fecal fistula, 452
Fibro-cystic tumors of uterus, 574
Fibroids of the uterus, 509
Fibroma and osteofibroma of vagina, 1036
of the breast, 210
of Fallopian tubes, 893
of urethra, 491
of the vagina, 51
histology of, 52
Fibro-myxoma of uterus, 540
Fibrous myxoma, 260
Fissure of neck of bladder, 519
Fistula, 360
classification, 385
fecal, 439
anatomical characters of, 440
diagnosis of, 440
etiology, 439
entero-vaginal, 439
in ano, 443
prognosis of, 440
recto-labial, 439
recto-vaginal, 439
symptoms of, 440
treatment of, 441
varieties, 439
in ano, 443
in difficult situations, 427
against rami of pubis, 428
mammary, 357
methods of cure, 389
recto-anal, 443
ureteral, 429
uretero-uterine, 432
uretero-vaginal, 429
urethro-vaginal, 420
obliteration of urethra, 425
treatment of, 420
Simon's method, 421
urinary, 369
classification of, 385
diagnosis of, 386
etiology of, 381
prognosis of, 387
transplantation method of cure, 414
treatment of, 388
vesico-uterine, 415
vesico-utero-vaginal, 417
Flatulence, hystero-neurotic, 137
Follicular cysts of ovary, 957
vaginitis, 23
Foreign bodies in urethra, 494
Freund's method of operating for cancer of uterus, 619
operation for carcinoma uteri, 619
Fritsch's method of extirpating uterus, 625
Fungoid excrescences of urethra, 490

G.

Galactocele, 328
Gangrene of fibroids of uterus, 667
Gastric tetanus of pregnancy, 109
Gastro-intestinal neuroses, 124
Gastro-pneumonic genito-reflex, 124
Genito-cardiac bronchial symptoms, 117
gastro-tetanus, 124
nervous disturbances, 97
Gestation, extrauterine, 874
Giant-celled sarcoma of breast, 249
Glandular-cystic proliferating of ovary, 964
hypertrophies, 166
Gonorrhœa, 480
Gonorrhœal vaginitis, 19
Goodell's operation for laceration of perineum involving sphincter ani, 760
Granular vaginitis, 19, 72
Gunshot wounds of breast, 346

H.

Hæmatocele, pudendal, 47
Hæmorrhage of the vagina, 47
ovarii, 852
Hæmorrhoids, 898, 927
causes, 898
changes in walls and contents, 899
diagnosis, 901
prognosis, 902
rupture, 900
symptoms, 901
treatment, 902
Hæmaturia, a symptom of vesical calculus, 534
of vesical tumor, 525
Heart, hysteroneuroses of, 104
pains in, 105
palpitations of, 104
Hegar's method of hysterectomy, 585
operation for laceration of perineum involving sphincter ani, 755
for posterior colporrhaphy, 44
for prolapse of uterus, 1150
for relaxation of perineum, 769
Hemorrhage into Fallopian tubes, 896
into ovary, 852
uterine, a symptom of cancer of uterus, 611–617
Hemorrhoids, urethral, 491
Heredity of carcinoma of uterus, 609
Hildebrandt's operation for laceration of perineum involving sphincter ani, 757
Histology of the breast, 335
Hyaline myxoma, 257
Hydatid cysts of the breast, 332
Hydrops ovariorum profluens, 1021
Hydrosalpinx, 903, 927, 1065
Hymen, atresia of, 26
Hyperæmia of bladder, 502
of Fallopian tubes, 896
of ovaries, 851
Hyperæsthesia of nipple, 345
Hyperplasia of mucosa of bladder, 523

Hypertrophy of bladder, 521
Hypogastric cystotomy, 538
Hypospadias, 462
Hysterectomy, 583, 585
  vaginal, 620, 621, 627
Hystero-neuroses, 59
  cardiac or central, 104
  cause of, 75
  cerebral, 82
  classification, 60
  diagnosis, 60, 76
  etiology, 59
  genito-reflex, 97
  glandular, 165
  laryngeal, 117
  mammary, 162
  medico-legal importance of, 70
  menstrual, 129
    treatment of, 134
  mental, 82
  of bronchi, 117
  of circulation, 103, 106
    cardiac or central, 104
    vascular or peripheral, 104, 106
  of eye, 139
  of gastro-intestinal canal, 124
  of heart, 104
  of individual organs, 81
  of intestines, 137
  of joints, 145
  of menopause, 61
  of menstruation, 62
  of pharynx, 114
  of pregnancy, 62, 136
    treatment of, 136
  of puberty, 61
  of respiratory tract, 114
  of skin, 151, 156
  of stomach, 124
  phenomena of, determined by ganglionic nervous system, 73
    by other causes, 73
  prognosis, 80
  résumé of, 171
  scientific importance of, 68
  treatment of, 78
    curative, local, 78
    oöphorectomy, 79
    palliative, 78
      cocaine, 79
      electricity, 78
      nervines, 78
      sedatives, 78
  varieties of, 60
Hystero-psychoses, 82–84
  cases and treatment, 87
  classification of, 84
  symptoms of, 85
Hysterorrhaphy, 889

I.

Incontinence of urine, 545
Inflammation and suppuration of sarcomata of breast, 235
Inflammations of breast, 349
Inheritance of carcinoma, 281
Injections, vaginal, causing vaginitis, 20
Intestines, fatal obstruction of, following ovariotomy, 822
Inversion, chronic, of uterus, 693
  of bladder, 500
  of uterus, treatment of, 707–715
Irritable bladder, 538

J.

Joints, hystero-neuroses of the, 145

K.

Keith's abdominal drainage-tube, 817
Kidneys, hystero-neuroses of, 170
Koeberlé's operation for retroflexion, 1132
Kolpokleisis for cure of urinary fistulæ, 437
Kolporrhaphia, anterior, 1150
  posterior, 1151

L.

Labor, abnormal, a cause of laceration of cervix, 644–646
  character of injury produced by, on perineum, 725
  complicated by uterine tumors, 591
Lacerations of cervix uteri, 641
    complications of, 655
    diagnosis of, 662, 669
    etiology of, 644
    pathological anatomy of, 649
    prognosis of, 670
    symptomatology of, 652
    treatment of, 675
Laceration of perineum involving sphincter muscles, 752
      various operations in, 754–762
  treatment of, 736
Laparotomy, for prolapsed ovaries, 891
  for removal of uterine appendages, 939
  in extra-uterine pregnancy, 190, 191
Laryngeal hystero-neuroses, 117
Le Fort's operation for colporrhaphy, 41
Leiomyoma of the ovary, 1048
Leopold's method of extirpating uterus, 625
Leucorrhœa as a symptom of uterine tumor, 565
Leucorrhœal discharges a symptom of cancer of uterus, 611
Lipoma of Fallopian tubes, 893
  of vagina, 51
Lipomatous myxoma, 256
Lithotomy, 537
Lithotrity, 536
Liver, hystero-neuroses of, 168
Lupus of the breast, 362
Lymphatic glands, invasion of, by carcinoma, 293
Lymphatics of vagina, 17
Lymphoid sarcoma of breast, 229

M.

Malformations of bladder, 490
of vagina, 24
Malignancy of carcinoma, 226
Malignant disease of uterus, 601
Mammæ, see *Breast*
Mammary glands, 247
hypertrophy of, 162
neoplasms, 197
Manic acute, following ovariotomy, 826
Marasmus in uterine cancer, 610
Marion's method of extirpating uterus, 693
Massage in the correction of retro-displacements of the uterus, 1127
pelvic for prolapse of ovaries, 800
Matrix, 549
as a cause of carcinoma, 253
Mastodynia, 303
Mastalgia, 303
Medullary carcinoma of breast, 254, 272, 305
myxoma, 256
Meissner's method of reducing inverted uterus, 715
Melanotic or pigmented sarcoma of breast, 230
Menopause, hystero-neuroses of, 61
reflex dermatoses in, 152
Menorrhagia in laceration of cervix, 658
or metrorrhagia as a symptom of uterine tumor, 564
Menstrual disorders, a symptom of laceration of cervix, 655
hystero-neuroses of stomach, 129
period, reflex dermatoses in, 151
Menstruation, hystero-neuroses of, 62
vicarious, from breast, 348
Mental diseases, dependence of, on derangements of sexual organs, 82
Metrorrhagia in laceration of cervix, 658
Micromazia, 338
Micturition, painful, in vesical calculus, 534
Milk, irregular or abnormal secretion of, 341
Miner's operation for intra-ligamentary or encapsulated ovarian cysts, 831
Morning sickness of pregnancy, 136
Mucous polyp of urethra, 490
Myo-fibroma of ovary, 1040
of uterus, 549
Myxadenoma of urethra, 490
Myxoma of breast, 255
Myxomatous changes in adenomata, 265
degeneration of fibroids of uterus, 557

N.

Neoplasms of Fallopian tubes, 892
of vagina, 51
Nephrectomy for fistula, 433
Nerves of vagina, 17
Nervous disturbances, genito-reflex, 97
cases and treatment, 100
symptoms of laceration of cervix, 655
system, disturbances of, 81
Neuralgia of the breast, 303
Neurosis, cardiac or cervical, 104
dermatic reflex, 151
gastric of pregnancy, 135
glandular, 160
hysteric, 59
of genito-urinary canal, 125
urethral, 495
vascular or peripheral, 106
visceral, 105
Neurosis, 81
Nipple and areola, diseases of, 344
congenital imperforation of, 341
excision of, leading to carcinoma, 288
hypertrophy of, 340
supernumerary, 339
Nussbaum's method of reducing inverted uterus, 714
of treating ovarian tumors, 788

O.

Obstetrical operations, cervical laceration of cervix, 645
Œdema of fibroids of uterus, 556
Oliguria as a symptom of irritable bladder, 540
Oophorectomy in treatment of hystero-neuroses, 79
Oophoritis, acute, 858
chronic, 865
Oöphorrhaphy, 889
Operation for removal of cancerous breast 318
Ovarian and extra-ovarian tumors, treatment of, 779
cystomata, 1050
cysts, development and histogenesis of, 980
diagnosis of, 1073, 1078
multilocular, 964
papilloma, superficial, 975
tumors, 780
cysts of parovarium, 779
diagnosis of, 1067, 1069
pathology of, 950
surgical treatment of, 782
tubo-ovarian cysts, 782
Ovaries and tubes, removal of, for uterine tumor, 581
diseases of the, 850
acute oöphoritis, 858
abscess-formation, 861
anatomy of, 858
diagnosis of, 862
etiology of, 858
follicular inflammation, 859
interstitial inflammation, 859
prognosis of, 864
symptoms of, 861
treatment of, 864
chronic oöphoritis, 865
definition, 865
etiology of, 866
gross anatomy of, 868
minute anatomy of, 876

Ovaries, diseases of—chronic oöphoritis, general observations, 850
hemorrhage into ovary, 852
diagnosis of, 856
follicular, 853
interstitial, 854
prognosis of, 857
symptoms of, 855
treatment of, 857
hyperæmia, 851
anatomy of, 852
etiology of, 851
prolapse of ovary, 881
anatomy of, 882
diagnosis of, 884
etiology of, 881
prognosis of, 885
symptoms of, 883
treatment of, 886
Campbell's method of replacing, 888
hot vaginal douches, 887
hygienic measures, 886
operative, 889
pessaries, 887
tuberculous oöphoritis, 880
removal of ("Battey's operation"), 837
after-treatment, 846
indications for, 842
methods of operating, 842
results, 847
theory of the operation, 842
Ovariotomy, 581, 789
abdominal incision, 803
accidents during, 824
bursting open of the wound, 827
shock, 826
tearing of gall-bladder, 824
of rectum, 824
of small intestine, 824
of ureters, 826
wounds of bladder, 825
of liver, 824
of womb, 825
acute mania in, 823
after-treatment, 819
anodynes, 821
diet, 820
evacuation of bowels, 821
flatus, treatment for, 820
position of patient, 821
rise of temperature, 821
to allay vomiting, 819
to avoid cystitis, 820
to establish reaction, 819
anæsthetics, 802
antiseptic solution for instruments, 802
for sponges, 802
articles needed for the operation, 797
assistants, 800
position during operation, 803
causes of death after, 790
complications of, 828
intra-ligamentary or encapsulated cyst, 828
development of, and course, 828
Ovariotomy, complications of—intra-ligamentary or encapsulated cyst, diagnosis of, 829
operations for, 830
Miner's operation, 831
contraindications for, 793
definition of, 789
drainage in, 816
hemorrhage from, 818
indications for, 817
placing of, 818
fatal obstruction of the bowels, 822
tympanitis a symptom of, 822
history of, 789
incomplete operations, 834
indications for, 794
inflammation of parotid glands, 823
instruments needed, 797
mania, acute, in, 823
operating-room, 796
phlegmasia alba dolens, 823
preliminary preparations, 800
preparation of patient for operation, 794
removal of both ovaries, 827
of drainage-tube, 819
return of cysts, 828
simple or aseptic, 792
statistics of, 790
suppression of urine, 822
surgical after-treatment, 823
tapping and removing the cyst, 806
tetanus, 822
treatment of the pedicle, 808
actual cautery, 808
extra-peritoneal method, 808
hemorrhage, 811
intra-peritoneal method, 809
ligature, 809–811
vaginal, 835
Ovary, cancer of, 1042
chondroma of, 1048
cystoma, multilocular ciliated, 968
papillary, 968
proliferating glandular, 964
cystomata, symptoms and complications of, 1058–1066
cysts of, dermoid, 1025
follicular, 957
fibroma and cysto-fibroma of, 1036
leiomyoma of, 1045, 1048
myo-fibroma of, 1040
proliferating glandular cystoma of, 964
papillary cystoma of, 968
sarcoma of, 1045

P.

Pain in cancer of the uterus, 613–617
in pelvic region as a symptom of uterine tumor, 564
in vesical calculus, 534
tumor, 525
of carcinoma, 287
of sarcomata of breast, 244
Palpitations of the heart, 104

Papillary angiomata of urethra, 491
cancer of ovary, 1043
Papilloma of bladder, 524
of Fallopian tubes, 895
ovarian, superficial, 976
Papillomatous ovarian cyst, 968–975
Paralysis vesicæ, 541
Paroöphoron, 1014
Parotid bubo, 168
glands, inflammation of, after ovariotomy, 823
Parovarian cysts, 1012
Parovarium, 1013
cysts of, 779
Pathology of ovarian tumors, 950
Pelvic floor, anatomy of, 719
injuries and lacerations of, 719. (See also *Perineum, injuries of.*)
and perineum, injuries and lacerations of, 719
hematocele from atresia of hymen, 26
Perineum, anatomy of, 720
function of, 722
injuries of, 720–722
complete rupture, 728
from parturition, 725
operative treatment, 737–751
perforation, 729
relaxation of vaginal outlet, 730, 765
superficial external tear, 727
Perineorrhaphy, 41
Peritonitis from atresia of hymen, 26
in uterine cancer, 615
Pessaries causing vaginitis, 20
description and uses of, in retrodisplacements of uterus, 1128
in prolapse of uterus, 1147
in treatment of cystocele, 500
of prolapse of ovaries, 887
Pharynx, hystero-neuroses of, 114
Phlegmasia alba dolens following ovariotomy, 823
Pigmentation of skin, reflex, 151
symmetrical, of pregnancy, 155
Pleiomazia, 339
Polk's method of vaginal hysterectomy, 627
Polymastia or polymazia, 339
Polythelia, 339
Polyuria as a symptom of irritable bladder, 540
Pregnancy complicated by uterine tumor, 591
extra-uterine, 175
gastro-neuroses of, 136
hystero-neuroses of, 62
reflex dermatoses in, 151
Procidentia uteri, 1134
Prolapse of bladder, 500
of ovary, 881
of urethra, 482
of urethral mucous membrane, 482
of vagina and uterus, 1134
Psoriasis of nipple, 345
Psychoses, 84
Puberty, hystero-neuroses of, 61
Puerperium, as a cause of prolapse of uterus, 1140
causing retro-displacements of uterus, 1112
Pyosalpinx, 927, 1026

R.

Récamier's method of operating for cancer of uterus, 618
operation for carcinoma uteri, 618
Rectocele, 57
operations for cure, 762
Recto-labial fistula, 439
Recto-vaginal fistula, 439
Reduction of inverted uterus, manual, 713
Reflex dermatic neuroses, 151
functional disturbances of sexual apparatus, 81
gastro-intestinal neuroses, 124
symptoms of breast, 162
Reflexes, central, 82
Respiratory tract, hystero-neuroses of, 114
Retroversion and retroflexion of uterus, 1110
Round-celled sarcoma of breast, 228
Rupture of the vagina, 46

S.

Saenger's operation for laceration of perineal floor, 762
Salivary glands, hystero-neuroses of, 166
Salpingitis, 909, 925
etiology of, 913
pathology of, 920
prevention of, 927
symptoms of, 917
treatment of, 927
Sarcoma of bladder, 524
of breast, 226. (See also *Tumors of breast, Sarcoma.*)
of Fallopian tubes, 895
of ovary, 1045
of urethra, 490
of vagina, 53
uteri, 635. (See also *Uterus, tumors of, malignant.*)
Sauter of Constance's operation for carcinoma uteri, 618
Schroeder's method of treating pedicle, 587
operation for cysts of vagina, 58
for prolapsus uteri, 1150
supravaginal excision of uterus, 631
Schultze's method of forcible reposition of prolapsed uterus, 891
forcible reposition of retro-displacements of uterus, 1125
Scirrhous carcinoma, 271–278, 302
Seborrhœa, reflex dermatosis, 155
Sexual apparatus, reflex functional disturbances, 81
organs, influence on mental functions, 82
Shock after laparotomy, 937
during ovariotomy, 826

Simon's operation for vesico-vaginal fistula, 401
Sims' operation for vesico-vaginal fistula, 392
uterine repositor, 1123
Siredey's method of treating cancer of uterus, 634
treatment of carcinoma uteri, 634
Skene's glands, catarrh of, 488
Skin, hystero-neuroses of, 151
involvement by carcinoma, 289
by sarcomata of breast, 242
Smith's method of replacing inverted uterus, 709
Spindle-celled sarcoma of breast, 231
Staffordshire knot, 582, 810
Staude's operation for laceration of perineum involving sphincter ani, 759
Sterility, induced, complicating laceration of cervix, 659
Stomach, hystero-neuroses of, 124
Stricture, urethral, 479
Subinvolution of uterus complicating laceration of cervix, 659
treatment of, 673
Sudoriferous glands, hystero-neuroses of, 167
Suppositories in vaginitis, 22
Suppression of urine after ovariotomy, 822
Suppuration of fibroids of uterus, 557
Syphilis of the breast, 362

T.

Tænia echinococcus causing hydatid cysts of breast, 332
Tait's operation for fibro-cystic myoma, 582
for removal of ovaries and tubes, 582
of hysterectomy, 583
Tampon in vaginitis, 23
Tate's method of reducing inverted uterus, 715
Telangiectatic changes in adenomata, 265
myxoma, 257
Teratomata of the ovary, 1025
Terebine in treatment of uterine cancer, 634
Thomas' method of hysterectomy, 585
treatment of chronic inversion of uterus, 707
Thrombi caused by cancer of uterus, 614
Thyroid, hystero-neuroses of, 166
Trachelorrhaphy for lacerated cervix, 675
in treatment of subinvolution of uterus, 675
Tubercular salpingitis, 925
Tuberculosis of the bladder, 522
of the vagina, 56
Tuberculous mammæ, 358
oöphoritis, 880
Tubes, Fallopian, development and anatomy of, 920
diseases of the, 892
Tubo-ovarian cysts, 782, 1020
Tumors of bladder, 523
Tumors of breast, 197
anatomy of, 209, 269, 270, 278
adenoma, 261
carcinoma, 269
cachexia of, 298
causes of, 282
diagnosis of, 302
evidences of local dissemination, 291
gross characters of, 278
growth of, 284
histogenesis of, 269
histology and varieties of, 270
infection of surrounding tissues, 287–291
inflammation and suppuration of, 278
inheritance of, 281
invasion of neighboring glands, 293
metastatic deposits, 295
pain of, 287
prognosis of, 298
recurrence of, 300
relative frequency of, 279
skin, involvement of, 289
structure of, 269
transformations of, 277
treatment of, 309
method of operating, 313
other than operating, 319
ulceration of, 289
classification of, 198
connective tissue or lymphatic cysts, 330
description of, 330
diagnosis of, 332
origin of, 330
treatment of, 332
cystic, 320
hydatid cysts, 332
etiology of, 208
fibroma, 215
myxoma, 255
sarcoma, 226
differential diagnosis of, 251
etiology of, 238
gross characters of, 233
histogenesis of, 226
infectious properties of, as compared to carcinoma, 250
inflammation and suppuration of, 235
involvement of skin and surrounding tissue, 242
metamorphoses and combinations of, 236
occurrence of, 238
pain of, 244
prognosis of, 248
rapidity of growth of, 239
recurrence and malignity of, 245
relative frequency of, 233
transformations of, 233
treatment of, 255
varieties of, 226

Tumors of uterus, malignant (see also Uterus, tumors of, malignant), 991
non-malignant, 963
ovarian and extra-ovarian, diagnosis of, 1007
pathology of, 959
treatment of, 779
pelvic, non-uterine and ovarian, 1050
adhesions, 1078
cysts, extra-peritoneal, 1054
dermoid cysts of ovary, clinical history and diagnosis of, 1052
diagnosis, 1004
of the character of the tumor, 1077
differential diagnosis, 1078
extra-peritoneal cysts, clinical history and diagnosis of, 1055
fibroids of the ovary, clinical history and diagnosis of, 1054
ovary, cancer of, 1087
fibroids of, 1083
sarcoma of, 1088
prognosis, 1064
urethral, 490

U.

Ulceration of carcinomata, 289
Ulcerations, urethral, 487
Ureter, congenital malposition of, 451
Utero-vaginal fistula, 429
Ureters, malformations of, 472
winding of, 459
Urethra and bladder, diseases of, 447 (See *Bladder and Urethra*)
abnormalities of, 475
anatomy and histology of, 447
angiomata of, papillary, 491
caruncle of, 491
congenital atresia of, 464
cysts of, 490
diseases of, 475
dislocation of, 481
embryology of, 459
epithelioma of, 490
fibroma of, 491
foreign bodies in the, 494
fungoid excrescences of, 490
hemorrhoids, 491
inflammation of, 485
malformations of, 461
diagnosis, 467
treatment, 467
myxadenoma of, 490
neuroses of, 495
papillary angiomata of, 491
polypi of, 490
prolapse of mucous membrane of, 482
sarcoma of, 490
tumors of, 490
ulcerations of, 487
varices of, 491
Urethral cysts, 490
neuroses, 495
stricture, 479
tumors, 490
Urethral ulcerations, 487
Urethritis, 485
Urethrocele, 475
Urethro-vaginal fistula, 429
Urinary fistula, 309
Urine, incontinence of, 646
in cystitis, 500–511
in irritable bladder, 510
suppression of, after ovariotomy, 822
Uterine appendages, removal of, 820
carcinoma (See *Uterus, tumors of*)
cervix, lacerations of, 941 (See also *Laceration of cervix uteri*)
sarcoma, 975 (See *Uterus, tumors of*)
tenesmus, as a symptom of uterine tumor, 964
Uterus, chronic inversion of, 695
course, progress, and termination, 705
etiology of, 700
exciting causes, 701
frequency of, 695
methods of reposition, 708
modes of, 696
pathological anatomy of, 695
prognosis, 705
symptomatology, 701
treatment, 705
varieties of, 694
displacements of, 1091
anteflexion, 1100
diagnosis of, 1107
etiology and pathological anatomy, 1100
symptoms of, 1104
treatment of, 1108
anteversion, 1096
diagnosis of, 1098
etiology and pathological anatomy of, 1096
symptoms and course of, 1097
treatment of, 1099
elevation of, 1152
latero-version of, 1152
retroposition of, 1155
retroversion and retroflexion, 1110
definition of, 1110
diagnosis of, 1119
etiology and anatomy of, 1111
symptoms of, 1116
treatment, 1120–1138
methods of retaining uterus in position, 1128
Alexander's operation, 1133
Koeberlé's operation, 1132
pessaries, 1128
method of introducing, 1130
torsion of, 1152
extirpation of, per vaginam, 620, 627
fibro-cystic myoma of, 574
inversion of, treatment of, 707–715
prolapse of, 1134
course of, 1146
diagnosis of, 1146
etiology of, 1139
pathological anatomy of, 1144

Uterus, prolapse of—symptoms of, 1145
treatment of, 1147
sarcoma on, 635 (See *Uterus, tumors of, malignant.*)
tumors of, malignant, 601
carcinoma, 601
diagnosis, 617
etiology, 609
pathology, 602
symptoms, 611
treatment, 618
sarcoma, 635
anatomy, 637
diagnosis, 639
etiology, 638
histology, 635
symptoms, 638
treatment, 640
non-malignant, 549
adenoid growths, 592
diagnosis, 598
pathology, 593
symptoms, 597
treatment, 598
fibro-cystic myoma, 574
treatment, 576
fibro-myoma or fibroid tumors, 549
development, 549
etiology, 550
pathology, 550
diagnosis of, 566
prognosis of, 573
treatment, 588

V.

Vagina, absence of, 30
operation for, 30
blood-supply of, 17
carcinoma or cancroid of, 54
cicatrices or cicatricial bands in, 33
congenital absence of, 24
cysts of, 56
treatment, 58
development of, 24
double or septate, 35
treatment of, 35
fibroma of, 54
foreign bodies in the, 50
treatment of, 50
functions of, 18
gross anatomy of, 17
hæmatoma of, 47
diagnosis of, 49
etiology of, 47
prognosis of, 49
symptoms of, 48
treatment of, 49
histology of, 17
lymphatics of, 17
malformations, 23
neoplasms of, 51
nerves of, 17
obliteration of, 30
prolapse of, 37, 1134
rupture of, 46
Vagina, rupture of—cause of, 46
prognosis of, 46
treatment of, 46
sarcoma of, 53
stenosis of, 33
tuberculosis of, 56
Vaginal atresia, 26
prognosis of, 27
symptoms of, 27
treatment of, 28
cicatrices, 33
causing vaginismus, 34
treatment of, 34
cystotomy, 537
douche, hot, in treatment of prolapse of ovaries, 887
in vaginitis, 22
extirpation of uterus, 620
hysterectomy, 621–627
outlet, relaxation or over-stretching of, 730
ovariotomy, 835
walls, displacements of, 37
cause of, 37
treatment of, 37
Vaginismus, definition of, 36
etiology of, 36
from cicatrices, 34
treatment of, 34
prognosis of, 36
treatment of, 36
Vaginitis, acute, 18
aphthous or diphtheritic, 19
bacteria of, 21
catarrhal, 19
chronic, 18
complications of, 22
differential diagnosis of, 19
duration of, 21
etiology of, 20
following scarlatina and measles, 20
gonorrhœal, 19
granular or follicular, 19, 23
pathology of, 20
prognosis of, 21
specific or gonorrhœal, 19
subacute, 18
symptoms of, 21
treatment of, 22
vaginal douche in, 22
Van de Warker's treatment of carcinoma uteri, 632
Varices, urethral, 491
Vesical atrophy, 522
calculi, 533
calculus as an obstacle to labor, 534
cysts, 525
fissure, 470
hyperæmia, 502
hypertrophy, 521
neuroses, 538
prolapse, 500
tenesmus, 483
as a symptom of vesical calculus, 534
Vesico-urethro-vaginal fistula, 417
Vesico-uterine fistula, 415

Vesico-vaginal and vesico-cervical fistula complicating lacerations of cervix uteri, 661
fistula, 669
Vicarious menstruation from breast, 318
Villous tumor of bladder, 624
Vomiting after anæsthesia prevented by bromide of potassium, 680
after ovariotomy, treatment, 819
of pregnancy, 79
cocaine in, 79
Vomiting of pregnancy, medicated vapors in, 79
Vulliet's method of treating cancer of uterus, 655

W.

Watt's method of reducing inverted uterus, 715
White's method of replacing inverted uterus, 710

GENERAL INDEX.

A.

Abscess, pelvic, i. 721
Acute oöphoritis, i. 858
Adenoid growths of uterus, ii. 592
Adenoma of breast, ii. 261
Amenorrhœa, i. 411
Anæsthesia in gynecological operations, i. 338
Anatomy of female pelvic organs, i. 95
Anteflexion, ii. 1100
Anteversion, ii. 1096
Antisepsis in gynecology, i. 328
Appendages, uterine, i. 161
Artificial impregnation, i. 425
Atrophy and hypertrophy of bladder, ii. 521
  of breast, ii. 344
  of uterus, i. 599

B.

Battey's operation, ii. 837
Benign growths of Fallopian tubes, ii. 892
Bladder, anatomy of, i. 188
  atrophy and hypertrophy of, ii. 521
  diseases of, ii. 447
  dislocations of, ii. 496
  fissure of neck of, ii. 579
  foreign bodies in, ii. 529
  hyperæmia of, ii. 502
  inflammation of, ii. 504
  inversion of, ii. 500
  malformations of, ii. 459, 461
  neuroses of, ii. 538
  new growths of, ii. 523
  paralysis of, ii. 541
  stone in, ii. 533
  tuberculosis of, ii. 522
Bladder and urethra, diseases of, i. 188
Boils of vulva, i. 494
Breast, absence of, ii. 338
  atrophy of, ii. 344
  erysipelas of, ii. 351
  fistule of, ii. 357
  hypertrophy of, ii. 341
  hystero-neuroses of, ii. 162
  inflammatory affections of, ii. 349, 353
  injuries of, ii. 345
  neuralgia of, ii. 365
  syphilis of, ii. 362
  tuberculosis of, ii. 358
  tumors of, ii. 197
Breast, tumors of, adenoma, ii. 261
    anatomy of, ii. 209
    carcinoma, ii. 269
    cysts, ii. 320
    development of, ii. 202
    fibroma, ii. 215
    myxoma, ii. 255
    sarcoma, ii. 226
Broad ligament, cysts of, ii. 1012, 1084

C.

Calculi, vesical, ii. 533
Cancer of ovary, ii. 1042, 1087
Carcinoma of breast, ii. 269
  of uterus, ii. 601
Cellulitis, pelvic, i. 705
Cervix, hypertrophy of, ii. 1134
  uteri, lacerations of, ii. 641
Chondroma of ovary, ii. 1048
Chronic inversion of uterus, ii. 693
  metritis, i. 599
  oöphoritis, ii. 865
Circulation, hystero-neuroses of, ii. 103
Clitoris, anatomy of, i. 106
Coccyodynia, i. 516
Connective tissue, pelvic, i. 684
    anatomy of, i. 215
Curette, i. 360
Cyst of round ligaments, i. 489
Cystic degeneration, i. 591
Cystitis, ii. 504
Cystocele vaginalis, ii. 498
Cysto-fibroma and fibroma of ovary, ii. 1036
Cystoma of ovary, ii. 964, 968
Cystomata, ovarian, ii. 1050
Cysts, extra-ovarian, ii. 779
  extra-peritoneal, ii. 1085
  follicular, ii. 957
  of breast, ii. 320
  of broad ligament, ii. 1012
  of ovary, dermoid, ii. 1025, 1082
  ovarian, differential signs of, ii. 1078
  physical signs of, ii. 1073
  parovarian, ii. 1084
  tubo-ovarian, ii. 782, 1020

D.

Degeneration, cystic, i. 591
Degenerations and ulcerations of cervix uteri, i. 587

Dermatosis, ii. 351
Dermoid cysts of ovary, ii. 1076, 1082
Development of female genitals, i. [illegible]
of uterus, arrested, i. 240
excessive, i. 242
irregular, i. 240
Diagnosis, gynæcological, i. 283
Dilatation of urethra, ii. 476
of uterus, before operation, i. 554
Diseases of breast, other than tumors, ii. 335
of ovaries, ii. 857
of vagina, ii. 47
of vulva, i. 477
Disorders of menstruation, i. 408
Displacements of uterus, ii. 1091
minor, ii. 1162
Dysmenorrhœa, i. 419
membranous, i. 434
Dyspareunia, i. 448

E.

Electricity in gynæcology, i. 583
Endometritis, i. 541, 648, 649
Erysipelas of breast, ii. 351
Extra-ovarian and ovarian tumors, ii. 779
peri-uterine cysts, ii. 1085
-uterine gestation, ii. 175
Eye, hystero-neuroses of, ii. 139

F.

Fallopian tubes, anatomy of, i. 161
development of, i. 87
diseases of, ii. 892
malformation of, i. 237
Fecal fistulæ, ii. 439
Fibro-cystic myoma of uterus, ii. 574
Fibroid tumors of uterus, ii. 549
Fibroids of ovary, ii. 1083
Fibroma and cysto-fibroma of ovary, ii. 1036
of breast, ii. 215
Fibro-myomata of uterus, ii. 549
Fissure of neck of bladder, ii. 519
of vulva, i. 494
Fistulæ, ii. 369
fecal, ii. 439
ureteral, ii. 429
urethro-vaginal, ii. 420
vesico-utero-vaginal, ii. 417
vesico-vaginal, ii. 369
Fistule of breast, ii. 357
Follicular cysts of ovary, ii. 957
Foreign bodies in bladder, ii. 529
in urethra, ii. 494
Fungosities, uterine, i. 594
Furunculosis vulvæ, i. 494

G.

Gangrene of vulva, i. 496
Gastro-intestinal canal, hystero-neuroses of, ii. 124
Genitals, anatomy of, i. 95
malformations of, i. 235
Gestation, extra-uterine, ii. [illegible]
incapacity for, i. 441
Glands, hystero-neuroses of, ii. 165
Gonorrhœa, ii. 486

H.

Hæmatocele and hæmatomata, i. 735
Hæmatoma of vulva, i. 496
Hermaphrodism, i. 267
Hernia of vulva, i. 483
History of American gynæcology, i. 17
Hydrocele, i. 488
Hydrosalpinx, ii. 982
Hymen, anatomy of, i. 117
malformations of, i. 282
Hyperæmia of uterus, i. 599
Hyperæsthesia of vulva, i. 510
Hyperplasia of uterus, i. 599
Hypertrophy and atrophy of bladder, ii. 521
of breast, ii. 341
of cervix, ii. 1134
of uterus, i. 599
Hystero-neuroses, ii. 59
cases and treatment, ii. 66 *et seq*
cause, ii. 76
diagnosis, ii. 76
of breast, ii. 162
of circulation, ii. 103
of eye, ii. 139
of gastro-intestinal canal, ii. 124
of general nervous system, ii. 81
of glands, ii. 165
of joints, ii. 145
of respiratory tract, ii. 114
of skin, ii. 151
prognosis, ii. 80
treatment, ii. 78

I.

Inflammation, peri-uterine, i. 675
Inflammatory affections of uterus, i. 541
Impregnation, artificial, i. 475
incapacity for, i. 448
Injuries and lacerations of the perineum and pelvic floor, ii. 719
and wounds of vulva, i. 479
Insemination, incapacity for, i. 442
Inversion of bladder, ii. 500
of uterus, chronic, ii. 693

J.

Joints, hystero-neuroses of, ii. 145

L.

Labia majora, anatomy of, i. 98
minora, anatomy of, i. 101
Lacerations of cervix uteri, ii. 641
of perineum and pelvic floor, ii. 719.
Leiomyoma of ovary, ii. 1048
Ligaments, round, anatomy of, i. 157

M.

Malformations of female genitals, i. 235
of vulva, i. 477

Malignant diseases of uterus, ii. 601
growths of Fallopian tubes, ii. 893
Mastodynia, ii. 365
Membranous dysmenorrhœa, i. 434
Menopause, i. 437
Menorrhagia and metrorrhagia, i. 415
Menstruation and its disorders, i. 408
vicarious, i. 415
Metritis, i. 546, 599
Metrorrhagia and menorrhagia, i. 415
Milk, abnormal secretion, ii. 341
Minor displacements of uterus, ii. 1152
Mons Veneris, anatomy of, i. 97
Müllerian ducts, development of, i. 85
Myomata of uterus, ii. 549, 574
Myxoma of breast, ii. 255

N.

Neoplasms of Fallopian tubes, ii. 892
of urethra, ii. 490
Nervous system, hystero-neuroses of, ii. 81
Neuroses, hystero-. See *Hystero-neuroses*, ii. 59
of bladder, ii. 538
of urethra, ii. 494
New growths of vulva, i. 518
Nipple, diseases of, ii. 344

O.

Œdema of vulva, i. 494
Oöphoritis, acute, ii. 858
chronic, ii. 865
tuberculous, ii. 880
Operations in gynecology, instruments, materials, etc., i. 337, 338, 340
preparatory treatment, i. 336
rules for, i. 333
plastic, i. 346
Operative gynecology, general considerations, i. 328
Ovarian and extra-ovarian tumors, ii. 779
cysts, differential signs of, ii. 1078
physical signs of, ii. 1073
tumors, pathology of, ii. 950
Ovaries, anatomy of, i. 167
development of, i. 76
diseases of, ii. 837, 850
malformations of, i. 235
Ovariotomy, ii. 789
Ovary, cancer of, ii. 1042, 1087
chondroma of, ii. 1048
cystomata of, ii, 1050
cysts of, dermoid, ii. 1025, 1082
fibroids of, ii. 1083
fibroma and cysto-fibroma of, ii. 1036
follicular cysts of, ii. 957
leiomyoma of, ii. 1048
prolapse of, ii. 887
proliferating glandular cystoma of, ii. 964
papillary cystoma of, ii. 968
sarcoma of, ii. 1045, 1088
superficial papilloma of, ii. 975
Ovulation, incapacity for, i. 458

P.

Papilloma of ovary, superficial, ii. 975
Paralysis of bladder, ii. 541
Parovarian cysts, ii. 1084
Parovarium, anatomy of, i. 180
cysts of, ii. 779
Pathology of ovarian tumors, ii. 950
Pelvic abscess, i. 721
cellulitis, i. 705
floor, anatomy of, i. 222
hæmatocele and hæmatomata, i. 735.
peritoneum, anatomy of, i. 204
peritonitis, i. 687
tumors other than uterine or tubal, ii. 1050
Perineum, anatomy of, i. 228
Peritoneum, pelvic, i. 682
anatomy of, i. 204
Peritonitis, pelvic, i. 687
Peri-uterine inflammation, i. 675
Plastic operations, i. 346
Precocity, i. 239
Prolapse of ovary, ii. 881
of urethra, ii. 482
of vagina and uterus, ii. 1134

R.

Rectum, anatomy of, i. 197
Respiratory tract, hystero-neuroses of, ii. 144
Retroflexion and retroversion, ii. 1110
Round ligaments, anatomy of, i. 157
cyst of, i. 489
Rupture of ovarian cysts, ii. 1008

S.

Salpingitis, ii. 909
Sarcoma of breast, ii. 226
of ovary, ii. 1045, ii. 1088
of uterus, ii. 635
Sclerosis of uterus, i. 599
Serpiginous vascular degeneration, i. 509
Skene's glands, catarrh of, ii. 488
Skin, hystero-neuroses of, ii. 151
Spasm of muscles of pelvic floor, i. 513
Sterility, i. 441
Stone in bladder, ii. 533
Stricture of urethra, ii. 479
Subinvolution of uterus, i. 599
of uterus and vagina, i. 637
Surgery, gynecological, general considerations, i. 328
Syphilis of breast, ii. 362

Tampon, i. 361
Therapeutics, general, i. 363
Thrombus of vulva, i. 497
Tuberculosis of bladder, ii. 522
of breast, ii. 358
oöphoritis, ii. 880
Tubes, Fallopian, anatomy of, i. 161
development of, i. 87
malformations of, i. 237
Tubo-ovarian cysts, ii. 782, 1020

Tumors, adenoid, ii. 592
false, ii. 1066
fibro-cystic myoma, ii. 574
of breast (see *Breast, tumors of*), ii, 197
of uterus, non-malignant, ii. 549
fibro-myomata or fibroids, ii. 549
ovarian and extra-ovarian, ii. 779
pathology of, ii. 950
pelvic, other than uterine or tubal, ii. 1050

U.

Ulcerations and degenerations of cervix uteri, i. 587, 593
of urethra, ii. 487
of vulva, i. 494
Ureteral fistulæ, ii. 429
Ureters, malformations of, ii. 459, 472
Urethra, anatomy of, i. 183
and bladder, diseases of, ii. 447
dilatation of, ii. 475
dislocation of, ii. 481
foreign bodies in, ii. 494
malformations of, ii. 459, 461
neuroses of, ii. 494
new growths of, ii. 490
prolapse of mucous membrane of, ii. 482
stricture of, ii. 479
ulcerations of, ii. 487
Urethritis, ii. 485
Urethro-vaginal fistulæ, ii. 420
Urinary fistulæ, ii. 369
Uterine appendages, i. 161
fungosities, i. 594
Uterus, anatomy of, i. 131
and vagina, development of, i. 87
prolapse of, ii. 1134
subinvolution of, i. 637
cervix, ulcerations and degenerations of, i. 587
chronic inversion of, ii. 693
development of, abnormal, i. 239, 240, 256
displacements of, ii. 1091
minor, 1152
inflammatory affections of, i. 541
Uterus, lacerations of cervix, ii. 641
lymphatics of, i. 686
malformations of, i. 238
malignant diseases of, ii. 601
carcinoma, ii. 601
sarcoma, ii. 635
non-malignant tumors of, ii. 549

V.

Vagina, absence of, ii. 30
and uterus, development of, i. 87
prolapse of, ii. 1134
subinvolution of, i. 637
anatomy of, i. 116
carcinoma of, ii. 54
cystocele, ii. 498
cysts of, ii. 58
diseases of, ii. 17
fibroma of, ii. 51
foreign bodies in, ii. 50
hæmatoma of, ii. 46
malformations of, i. 257; ii. 24
neoplasms of, ii. 51
relaxation of, ii. 730, 765
rupture of, ii. 46
sarcoma of, ii. 53
subinvolution of, i. 667
tuberculosis of, ii. 56
Vaginal ovariotomy, ii. 835
Vaginismus, ii. 36
Varicose veins of vulva, i. 496
Vesical calculi, ii. 533
Vesico-vaginal fistulæ, ii. 369
Vesico-utero-vaginal fistulæ, ii. 417
Vestibule, anatomy of, i. 110
Vicarious menstruation, i. 415
Vulva, dermal affections of, i. 501
development of, i. 92
diseases of, i. 477
malformations of, i. 264, 477
Vulvitis, i. 490
Vulvo-vaginal gland, diseases of, i. 498

W.

Wolffian bodies, development of, i. 73

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